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## Vol. 5, No. 10

Environmental Protection Agency, Research Triangle Park, N C

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This periodical is published to inform air pollution personnel of the Environmental Protection Agency (EPA), and others, of technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Translations are cited with their sources whenever possible. The subject fields are as follow: Emission Sources; Control Methods; Measurement Methods; Air Quality Measurements; Atmospheric Interactions; Basic Science and Technology; Effects-Human Health; Effects-Plants and Livestock; Effects-Materials; Economic Aspects; Standards and Criteria; Legal and Administrative; Social Aspects; and General and Miscellaneous. All abstracts are listed under one of the above subject fields. A subject and author index are included. This issue contains abstracts 40155 - 41192.

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# AIR POLLUTION ABSTRACTS

## 40154-41192

OCTOBER 1974

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U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air Quality Planning and Standards
Research Triangle Park, N. C. 27711

# AIR POLLUTION ABSTRACTS

OCTOBER 1974 VOLUME 5, NO. 10

Prepared by
Air Pollution Technical Information Center (APTIC)
Research Triangle Park, North Carolina 27711

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The terms that most closely describe the information presented in the documents are arranged alphabetically.

Author Index .......... AI-1

Personal authors are arranged alphabetically. The names are presented last name first. When the author is a primary author, an asterisk precedes the Abstract Number.

# INTRODUCTION

This periodical is intended to inform personnel of the Environmental Protection Agency (EPA), and others who are also professionally interested in air pollution, of selected technical literature recently accessioned by the Air Pollution Technical Information Center (APTIC). For each accession, its Abstract Number, APTIC accession number, bibliographic citation, and abstract are given. Semiannual cumulative indexes to both subject and author are also sent to all recipients of this monthly publication.

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As another service, abstracts of all of the literature in APTIC (not just in a single issue of this periodical) on any subject related to air pollution will be provided free of charge upon request. APTIC can search information more recent than that in the current issue of this periodical because of the lapse of time entailed by editorial, make-up, and printing work. More than 1400 subject index terms are available for such searching ---more than those included in the subject index in each issue.

Acknowledgement is given to the Technical Publications Branch, Informational Services Division, Office of Administration, Research Triangle Park, N.C. for the make-up of the cover and for arrangement of printing and distribution.

Feedback from our users, including suggestions of articles, are always welcome.

# APTIC Publications

*Air Pollution Aspects of Emission Sources: Primary Lead Production - A Bibliography with Abstracts*, June 1973, GPO No. EP 4.9:126, $0.65.

*Air pollution Aspects of Emission Sources: Primary Copper Production - A Bibliography with Abstracts*, June 1973 GPO No. EP 4.9:125, $0.70.

*Air Pollution Aspects of Emission Sources: Pulp and Paper Industry - A Bibliography with Abstracts*, March 1973, GPO No. EP 4.9:121, $2.35.

*Air Pollution Aspects of Emission Sources: Primary Aluminum Production - A Bibliography with Abstracts*, June 1973, GPO No. EP 4.9:119, $0.90.

*Mercury and Air Pollution: A Bibliography with Abstracts*, October 1972, GPO No. EP 4.9:114, $1.25.

*Odors and Air Pollution: A Bibliography with Abstracts*, October 1972, GPO No. EP 4.9:113, $3.00.

*Air Pollution Aspects of Emission Sources: Petroleum Refineries - A Bibliography With Abstracts*, July 1972, GPO No. EP 4.9:110, $1.25.

*Air Pollution Aspects of Emission Sources: Iron and Steel Mills - A Bibliography With Abstracts*, May 1972, GPO No. EP 4.9:107, $1.00.

*Air Pollution Aspects of Emission Sources: Boilers - A Bibliography With Abstracts*, May 1972, GPO No. EP 4.9:105, $2.00.

*Hydrochloric Acid and Air Pollution: An Annotated Bibliography*, July 1971, GPO No. EP 4.9:100, $0.55.

*Chlorine and Air Pollution: An Annotated Bibliography*, July 1971, GPO No. EP 4.9:99, $0.55.

*Air Pollution Aspects of Emission Sources: Electric Power Production - A Bibliography With Abstracts*, May 1971, GPO No. EP 4.9:96, $2.25.

*Air Pollution Aspects of Emission Sources: Cement Manufacturing - A Bibliography With Abstracts*, May 1971, GPO No. EP 4.9:95, $0.50.

*Air Pollution Aspects of Emission Sources: Sulfuric Acid Manufacturing - A Bibliography With Abstracts*, May 1971, GPO No. EP 4.9:94, $0.65.

*Air Pollution Aspects of Emission Sources: Nitric Acid Manufacturing - A Bibliography With Abstracts*, May 1971, GPO No. EP 4.9:93, $0.45.

*Air Pollution Aspects of Emission Sources: Municipal Incineration - A Bibliography With Abstracts*, May 1971, GPO No. EP 4.9:92, $1.00.

*Photochemical Oxidants and Air Pollution: An Annotated Bibliography (2 Volumes)*, March 1971, GPO No. EP 4.9:88, $6.25.

*Beryllium and Air Pollution: An Annotated Bibliography*, February 1971, GPO No. EP 4.9:83, $0.40.

*Asbestos and Air Pollution: An Annotated Bibliography*, February 1971, GPO No. EP 4.9:82, $0.50.

*Municipal Incineration. A Review of Literature*, June 1971, GPO No. EP 4.9:79, $1.00.

*Hydrocarbons and Air Pollution: An Annotated Bibliography (2 Volumes)*, October 1970, GPO No. HE 20.1309:75, $5.00.

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# RECENT CONTRACT AWARDS

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## Contracts Management Division, EPA

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MODELING OF AIR QUALITY IMPACT OF SELECTED POWER PLANTS.
Geomet, Incorporated, 50 Monroe Street, Rockville, Maryland 20850

**Contract No. 68-02-1484,** RFP No. Du-74-A093 ........................................ *$134,078*
MODELING OF AIR QUALITY IMPACT OF SELECTED POWER PLANTS.
Walden Research Division of Abcor, Inc., 201 Vassar Street, Cambridge, Massachusetts 02139

**Contract No. 68-02-1835,** RFP No. Du-74-A139 ........................................ *$104,173*
HYDROCARBON EMISSION REDUCTION FROM ETHYLENE DICHLORIDE PROCESSES.
Allied Chemical Corporation, P. O. Box 1057 R, Morristown, New Jersey 07960

**Contract No. 68-02-1485,** RFP No. Du-74-A283 ........................................ *$50,000*
PARAMETRIC STUDIES OF THE PRODUCTION OF STORABLE CLEAN FUELS FROM AGRICULTURAL, FORESTRY AND ANIMAL WASTES.
Georgia Tech Research Institute, Georgia Institute of Technology, 305 Administration Building, Atlanta, Georgia 30332

**Contract No. 68-02-1802,** RFP No. Du-74-A192 ........................................ *$195,862*
EVALUATION OF VENTURI SCRUBBER SYSTEMS FOR CONTROL OF PARTICULATE EMISSIONS FROM A COAL FIRED UTILITY BOILER.
Meteorology Research, Inc., 464 West Woodbury Road, Altadena, California 91001

**Contract No. 68-02-1814,** RFP No. Du-74-A303 ........................................ *$1,290,998*
PROTOTYPE STUDY OF LIME AND LIMESTONE SCRUBBERS FOR SO2 AND DUST REMOVAL.
Bechtel Corporation, Fifty Beale Street, San Francisco, California 94119

**Contract No. 68-02-1375,** Task Order No. 13 ........................................ *$187,000*
CONDUCT OF THE GREAT PLAINS MONITORING STUDY.
PEDCo-Environmental Specialists, Inc., Suite 13, Atkinson Square, Cincinnati, Ohio 45246

**Contract No. 68-02-1808,** RFP No. Du-74-X001 ........................................ *$242,506*
DIRECT COAL BURNING FUEL CELL.
Stanford Research Institute, Menlo Park, California 94025

**Contract No. 68-02-1490,** RFP No. Du-74A244 ........................................ *$204,527*
FINE PARTICLE CHARGING SYSTEM DEVELOPMENT.
Southern Research Institute, 2000 Ninth Avenue South, Birmingham, Alabama 35205

**Contract No. 68-02-1074,** RFP No. Du-74-A261 ........................................ *$221,100*
PARTICLE SIZE DISTRIBUTION ANALYSIS AND IDENTIFICATION AND QUANTIFICATION OF GASEOUS AND PARTICULATE TOXIC AND HAZARDOUS EMISSIONS FROM OIL AND OIL-FIRED INDUSTRIAL BOILERS.
KVB Engineering, Inc., 17332 Irvine Boulevard, Tustin, California 92680

**Contract No. 68-02-1695,** RFP No. Du-74-C877 ........................................ *$33,155*
PARTICLE SIZING MONITOR.
Environmental Systems Corporation, P. O. Box 2525, Knoxville, Tennessee 37901

**Contract No. 68-02-1738,** RFP No. Du-74-B467 ........................................ *$198,017*
CHROMOSOMAL ABNORMALITIES ASSOCIATED WITH KNOWN LOW LEVEL OCCUPATIONAL OZONE EXPOSURES IN WELDER TRAINEES.
Columbia University, College of Physicians and Surgeons, 630 West 168th Street, New York, N. Y. 10032

**Contract No. 68-02-1753,** RFP No. Du-74-B419 ........................................ *$48,325*
STUDY TO DEVELOP MODIFICATIONS OF THE STANDARD MULTIPLE-SOURCE GAUSSIAN-PLUME URBAN DISPERSION MODEL, CAPABLE OF UTILIZING MULTIPLE-STATION INFORMATION ON WIND SPEED AND DIRECTION.
Environmental Research & Technology, Inc., 429 Marrett Road, Lexington, Massachusetts 02173

**Contract No. 68-02-1099,** Modification No. 4 ........................................ *$220,769*
ADDITIONAL WORK FOR A STUDY OF FUEL GAS (LOW BTU) CLEAN UP SYSTEMS IN INTEGRATED COMBINED CYCLE PLANTS.
United Aircraft Corporation, Research Laboratories, 400 Main Street, East Hartford, Connecticut 06180

**Contract No. 68-02-1723,** RFP No. Du-74-B430 ........................................ *$108,022*
THE EFFECTS OF LOW LEVELS OF NO2, O3, AMBIENT AIR ON CARDIAC PULMONARY AND PERIPHERAL CIRCULATORY FUNCTION IN ADULT MALES.
The Regents of the University of California, University of California, Santa Barbara, California 93106 (NOTE: Contract contains option in the amount of $98,520)

**Contract No. 68-02-1826,** RFP No. Du-74-A081 ........................................ *$41,079*
SITE SELECTION FOR AMBIENT AIR MONITORING.
Environmental Research & Technology, Inc., 429 Marrett Road, Lexington, Massachusetts 02173

**Contract No. 68-02-1375,** Task Order No. 15 ........................................ *$30,000*
AMBIENT AIR QUALITY MONITORING AT GARFIELD, UTAH SMELTER.
PEDCo-Environmental Specialists, Inc., Suite 13, Atkinson Square, Cincinnati, Ohio 45246

**Contract No. 68-02-1747,** RFP No. Du-74-B547 ........................................ *$93,100*
DRY DEPOSITION MEASUREMENT MODELING FOR FOSSILO FUEL EFFLUENTS.
Battelle Memorial Institute, Pacific Northwest Laboratories, P. O. Box 999, Richland, Washington 99352

**Contract No. 68-02-0758,** RFP No. Du-74-B469 and RFP No. Du-74-B470.... *$643,800*
MOBILE AIR MONITORING FIELD STATIONS.
Rockwell International Corporation, Science Center, P. O. Box 1085, Thousand Oaks, California 91360 (NOTE: Contract contains options in the amount of $954,682 for portable air monitors and addition of aerosol monitoring instruments to existing CHAMP stations)

**Contract No. 68-02-1451,** RFP No. Du-74-A076 ........................................ *$332,629*
BATCH PRESSURIZED COMBUSTION/DESULFURIZATION VARIABLE STUDY.
Exxon Research & Engineering Company, P. O. Box 8, Linden, New Jersey 07036

**Contract No. 68-02-1353,** Modification No. 3 ........................................ *$96,700*
EVALUATION OF CONTROL TECHNIQUES FOR EMISSIONS FROM ENCLOSED ASBESTOS SOURCES.
IIT Research Institute, 10 West 35th Street, Chicago, Illinois 60616

**Contract No. 68-02-1473,** RFP No. Du-74-A082 ........................................ *$264,000*
PERFORMANCE OF STUDIES OF AIR POLLUTION CONTROL TECHNOLOGY AND COSTS FOR SELECTED SOURCES.
Industrial Gas Cleaning Institute, Inc., P. O. Box 1333, 999 Bedford Street, Stamford, Connecticut 06904 (NOTE: Contract contains option in the amount of $36,710)

**Contract No. 68-02-1825,** RFP No. Du-74-X002 ........................................ *$66,055*
EVALUATION AND OPTIMIZATION OF FUEL CELL PROGRAM.
Burns and Roe, Inc., 700 Kinderkamack Road, Oradell, New Jersey 07649

**Contract No. 68-02-1498,** RFP No. Du-74-A246 ........................................ *$199,930*
EXTENSION OF APPLICATION OF COMBUSTION MODIFICATION TECHNIQUES TO PACKAGE BOILERS.
Ultrasystems, Inc., 500 Newport Center Drive, Newport Beach, California 92660

**Contract No. 68-02-1379,** Task Order No. 1 ........................................ *$65,000*
INSTALLATION OF EIS/CDHS FOR REGION IV AGENCIES.
IBM Corporation, Federal Systems Division, 18100 Frederick Pike, Gaithersburg, Maryland 20760

**Contract No. 68-02-1719,** RFP No. Du-74-B419 ........................................ *$45,700*
HYDROCARBON COMPOSITION CHANGES UPON THE OXIDANT-HC RELATIONSHIP.
Esso Research & Engineering Company, P. O. Box 172, Linden, New Jersey 07036

**Contract No. 68-02-1379,** Task Order No. 2 ........................................ *$60,000*
INSTALLATION OF AQDHS/CDHS FOR REGION IV STATE AGENCIES.
IBM Corporation, Federal Systems Division, Federal Systems Center, 18100 Frederick Pike, Gaithersburg, Maryland 20760

**Contract No. 68-02-1745,** RFP No. Du-74-B515 ........................................ *$211,354*
EFFECT OF NO2 ON LUNG FUNCTION IN HUMAN SUBJECTS WITH ASTHMA AND CHRONIC BRONCHITIS.
University of Maryland, 660 West Redwood Street, Baltimore, Maryland 21201

**Contract No. 68-02-1687,** RFP No. Du-74-B521 ........................................ *$44,351*
PREPARATION AND CHARACTERIZATION OF FINELY PARTICULATE ENVIRONMENTAL CONTAMINANTS FOR BIOLOGICAL EXPERIMENTATION.
IIT Research Institute, 10 West 35th Street, Chicago, Illinois 60607

**Contract No. 68-02-1491,** RFP No. Du-74-A157 ........................................ *$87,850*
DEMONSTRATION FEASIBILITY FOR PERMANENT CONTROL OF NON-FERROUS SMELTERS.
Research Triangle Institute, P. O. Box 12194, Research Triangle Park, North Carolina 27709

**Contract No. 68-02-1360,** Modification No. 3...................................................... *$121,787*
DESIGN PRINCIPLES FOR THE CONTROL OF POLLUTANT EMISSIONS FROM THE COMBUSTION OF LOW-BTU GAS.
Institute of Gas Technology, 3424 South State Street, IIT Center, Chicago, Illinois 60616

# SUBJECT FIELDS AND SCOPE NOTES

## 1. EMISSION SOURCES

Information pertaining to an industry, process, or material associated with air pollution. Documents in this category are concerned primarily with characteristics of a specific class of emission sources including types, rates, industries; secondary coverage may include effects, control methods, etc.

## 2. CONTROL METHODS

Includes equipment and both specific source control and general abatement efforts. Included are documents describing the operating principles, design, operation, efficiency, etc., of equipment and methods of removing pollutants. The scope of the document can vary from a device for a specific source to an approach applicable to an entire industry--e.g., automobiles.

## 3. MEASUREMENT METHODS

Includes equipment as well as methods. Confined to development testing and evaluation of pollutant determination methods (sampling, analytical, monitoring) and equipment, as such. Data obtained by use of methods in specific applications are placed in the applicable subject categories.

## 4. AIR QUALITY MEASUREMENTS

Pollution measurements in the ambient air, generally related to specific geographical locations, such as area surveys. Also includes general reviews of area situations and emission source inventories.

## 5. ATMOSPHERIC INTERACTION

All chemical and physical phenomena occurring in the atmosphere Included is material on dispersion, air pollution forecasts, meteorological effects, topographical effects, photochemical reactions in the atmosphere, etc. Laboratory studies of photochemical reactions are assigned to Basic Science and Technology.

## 6. BASIC SCIENCE AND TECHNOLOGY

General discussions or data compilations for the basic physical and chemical properties of pollutants. Theoretical and laboratory studies on related chemical and biological reactions and mechanisms. Mass transfer and other basic knowledge related to process engineering applications in emission control or abatement. Excludes photochemical studies in the atmosphere and biochemical studies related to effects of air pollution.

## 7. EFFECTS--HUMAN HEALTH

Covers medical and epidemiological studies; biological effects other than those on plants and livestock produced by air pollutants; laboratory animal experiments.

### 8. EFFECTS--PLANTS AND LIVESTOCK

Effects on vegetation--crops, trees, other plants--and on livestock as distinguished from laboratory experimental animals.

### 9. EFFECTS--MATERIALS

Deterioration, corrosion, etc., of physical materials, buildings, and structures.

### 10. ECONOMIC ASPECTS

Economic implications of air pollution and its control, e.g., economic losses from pollution damage, and costs of control programs or equipment in general.

### 11. STANDARDS AND CRITERIA

Recommended or adopted guides, criteria and standards for allowable emission limits or pollutant concentrations, air quality, equipment characteristics, and fuels.

### 12. LEGAL AND ADMINISTRATIVE

Legal aspects include legislation, ordinances, rules, litigation, hearings, decisions, etc. Administration covers administrative and miscellaneous information concerning control agencies and control and research programs. Typical topics are personnel, budgets, contractual activities and program descriptions.

### 13. SOCIAL ASPECTS

Sociological and psychological aspects such as social attitudes public opinion studies, public relations, and public information.

### 14. GENERAL AND MISCELLANEOUS

Reviews of general problems, trends and background. Documents not assignable to other categories.

# ABSTRACT BULLETIN

## EMISSION SOURCES

### 1974

**40155** **APTIC NO. 64657**

Bathke, H., L. van Heyden, and K. Wienke

NITROGEN OXIDES MEASUREMENTS IN BOILER FLUE GASES. *(Stickoxidmessungen in Feuerungsabgasen von Kesselanlagen). Text in German. VDI (Ver. Deut. Ingr.) Ber., no. 211:100-106, 1974. 10 refs.*

Results of test stand measurements of the nitrogen oxides concentrations in the flue gases of a commercial heating boiler fired with different types of natural gases and coke-oven gas are presented. The analyses were carried out by means of a Thermo Electron chemiluminescent instrument model 10 A. The specific nitrogen oxide emission for the heating boiler ranged from 85 to 145 g/Gcal, averaging 110 g/Gcal. In a natural gas-fired flame-tube boiler, the specific nitrogen oxide emission was in a range of 125-270 g/Gcal, averaging 210 g/Gcal. The thermal formation of nitric oxide was responsible for all nitrogen oxides emissions, for which temperatures over about 1600 C are required. In flame-tube boilers, the nitrogen oxides formed in the high- temperature zone remained unchanged in quantity during their passage through zones with lower temperature.

**40156** **APTIC NO. 64936**

Bell, O.

FORMATION OF OXIDES OF NITROGEN IN STATIONARY FUEL OIL FLAMES AT ATMOSPHERIC PRESSURE. *(Stickstoffoxidbildung in stationaeren Heizoelflammen bei Atmosphaerendruck). Text in German. Brennstoff-Waerme-Kraft, 26(7):291-297, July 1974. 10 refs.*

A 4 m long cylinder with the burner installed at the bottom was used for study of oxides of nitrogen formation in stationary fuel oil flames. The thermal capacity was 1,000,000 kcal/hr. The cylinder was formed by individual double-walled rings with a height of 250 mm in the lower section and 500 mmm in the upper section. Each ring had a separate cooling water feeder. For atomization of the fuel a Y-nozzle was used. The fuel oil had a density at 15 C of 0.83 g/ml, a flame point of 60 C, a kinetic viscosity at 20 C of 6 c St, a heating value of 10,200 kcal/kg, a sulfur content of 0.33 wt% and a nitrogen content of 0.0072 wt%. The factors influencing nitric oxide formation, e.g., flame temperature, oxygen concentration, and residence time were studied at 3 different load points of the burner with the surplus air varied between 5 and 15%. The geometry of the burner had an important influence on the formation of oxides of nitrogen. A reduction of the NO emission by adjustment of the burners is feasible to a limited extent. Additional reductions can be achieved through modifications of the combustion process. Flue gas recirculation is useful in all cases where flame temperature and oxygen concentration are the main causes of NO formation.

**40157** **APTIC NO. 63152**

Bespalko, L. E., V. A. Gofmekler, L. D. Rusalenko, and M. V. Fokin

EXHAUST GASES OF SEA SHIP ENGINES AS SOURCES OF ATMOSPHERIC POLLUTION IN SEAPORTS. *(Vykhlopnyye gazy dvigateleyimorskikh sosudov - istochnik zagryazneniya atmosfernogo vozdukha porodov). Text in Russian. Gigiena i Sanit., no. 4:13-16, 1974. 6 refs.*

Exhaust gases of ship engines may be one of the sources of air pollution in seaports. The long stretch of the pier and the great number of ships are the peculiar features of seaports that distinguish them from the usual industrial sources of air pollution. The main ingredients of the exhaust gases are carbon monoxide, hydrocarbons, nitrogen dioxide, sulfur dioxide, and soot discharged by the main ship engines at the time of arrival and departure of a ship, by the auxiliary engines which are constantly running, and by the auxiliary steam boilers working at the time of moorage.

**40158** **APTIC NO. 63118**

Chaiken, R. F., E. B. Cook, and T. C. Ruhe

TOXIC FUMES FROM EXPLOSIVES: AMMONIUM NITRATE-FUEL OIL MIXTURES. *Pittsburgh Mining and Safety Research Center, Pittsburgh, Pa., Bureau of Mines RI 7867, 27p., 1974. 24 refs.*

Prilled and pulverized ammonium nitrate fuel oil (AN-FO) mixtures containing varying amounts of fuel oil were investigated to quantify the effects of stoichiometric composition, nonideal detonation behavior, and expansion volume on the production of carbon monoxide, nitric oxide, and nitrogen dioxide fumes. Experimental fume measurements were obtained in the Bureau of Mines large closed gallery facility and in the standard Crawshaw- Jones apparatus using a prepackaged charge configuration containing about 450 g of explosive. The theoretical calculation of toxic fumes was achieved with an equilibrium detonation code called TIGER. The nitrogen oxides fumes from the large gallery test were in essential agreement with the Crawshaw-Jones results. The TIGER calculations offer a good approach to the prediction of toxic fumes. There is a basic problem in extrapolating laboratory measurements of CO fumes to mine conditions due to the postdetonation oxidation of CO to CO2. The detonation velocity decay rate of an explosive is a useful experimental parameter for correlating toxic fumes production with nonideal detonation behavior. (Author abstract modified)

**40159** **APTIC NO. 64819**

Dorr, Karl-Heinz, Hugo Grimm, and Rolf Kola

ABSORBER FOR SULFUR TRIOXIDE. *(Metallgesellschaft Aktiengesellschaft, Frankfurt am Main (Germany)) U. S. Pat. 3,788,043. 5p., Jan. 29, 1974. 6 refs. (Appl. Oct. 12, 1971, 3 claims).*

This invention relates to an interstage absorber between contact oxidation stages of a plant for converting sulfur dioxide to sulfur trioxide and to a method of operating such an absorber. In this contact process, between the contact stages there is provided an interstage absorber for removing sulfur trioxide from the gases emerging from a previous stage. The gases are passed by a venturi system in intimate contact with sulfuric acid into a settling chamber in which sulfuric acid is collected in the sump and then, by another gas/liquid contactor or reagitator, into a further settling chamber with an outlet at its upper end. In prior-art systems, interstage absorption generally uses a device similar to the final absorber. This has the inherent disadvantage that the final absorber is designed for maximum removal of sulfur trioxide from the gases at the ex-

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pense of efficiency, whereas interstage absorption does not need such total removal.

**40160** **APTIC NO. 64620**

Eberan-Eberhorst, Robert and Dusan Gruden

THE ODORS OF EXHAUST GASES FROM OTTO ENGINES. *(Der Abgasgeruch des Ottomotors). Text in German. Motortech. Z. (Stuttgart), 35(8):246-250, 1974. 12 refs.*

The odors of exhaust gases stem from a mixture of various chemical compounds which develop during the combustion process or which are already present in the fuel. A reduction or elimination of the exhaust gas odors requires knowledge of the causes and the mechanism which led to their development. The exact determination of the individual components exhaust gas odor is not simple and the difficulties are enhanced by the number of these components participating in further reactions, which oxidize in the exhaust pipe or the atmosphere and which dissolve in water or are absorbed in it. Since presently no objective method is available for measurement of odors, the human nose is the only means. The only way to determine odor intensity is the determination of the odor threshold by dilution of the exhaust gases with odorless ambient air. The various design and operating parameters of the engine influence the magnitude of the exhaust gas emission and the intensity of the exhaust gas odor. The exhaust gas reaches the highest odor intensity at those fuel-to-air ratios (lambda 1.1 to 1.3) at which the odorous components (such as oxidized hydrocarbons, and nitrogen compounds) in the exhaust gas reach the maximum concentration. A reduction of the odor intensity of automobile exhausts can be achieved through adequate selection of engine parameters such fuel-to-air-ratio, compaction ratio, and ignition angle and through operation of the engine with gaseous fuel.

**40161** **APTIC NO. 64497**

Frankenberg, Theodore T. and Kenneth J. Skipka

METEOROLOGY, POWER GENERATION AND SULFUR DIOXIDE CONCENTRATIONS DURING A MAJOR AIR STAGNATION EPISODE. *Combustion, 45(1):6-12, July, 1974. 5 refs.*

A study of power generation, meteorology, and ambient sulfur dioxide concentrations in the upper Ohio River Valley area for the period July 19-23, 1972 is presented. Power generation remained at normal levels and the SO2 concentrations were not in excess of, nor did they approach the guidelines established by the Federal Environmental Protection Agency. The concentration levels were low to moderate in all time frames, and did not increase as the episode progressed. Short-term (6-12 hr) increases and decreases were present, but the peak hourly concentrations were normal and well below the 3-hr federal guidelines. Electric generation in the upper Ohio Valley area continued at essentially its normal level, except for some curtailment due to reduction of load over the weekend and some further curtailment from forced outages of boiler equipment. Considering the meteorological conditions and electric generation in this area, it appears that the power plants did not adversely affect the ground-level concentrations as had been expected.

**40162** **APTIC NO. 63042**

Goldish, Josette C., Franklin D. Trowt, John R. Ehrenfeld, Khee M. Chng, and Richard Stockdale

DEVELOPMENT OF A METHODOLOGY TO ALLOCATE LIQUID FOSSIL FUEL CONSUMPTION BY COUNTY. *Abcor, Inc., Cambridge, Mass., Walden Research Div., Environmental Protection Agency Contract 68-02-1067, Proj. 1, Rept. EPA-450/3-74-021, 140p., March 1974. 57 refs.*

NTIS: PB 232209/AS

Methods are developed for the routine determination of distillate and residual oil consumption by industrial, commercial, and residential consumers, as well as for gasoline and diesel fuel consumed by light and heavy duty motor vehicles with the expectation that up-to-date air pollution emissions from area sources burning fuel oil can be derived from these consumption figures. The resulting data are allocated to counties for input and storage in the National Emissions Data System area source format. Seasonal fluctuations of fuel oil use by consumer category and geographic region and references for determining sulfur content of fuel oils on a county basis are also analyzed. The computer processing techniques for reporting the data are provided also.

**40163** **APTIC NO. 63290**

Gomi, Tsutomu and Yukio Honmo

THE EFFECTS OF THE ATMOSPHERE ON EXHAUST GAS COMPOSITION (THE EFFECTS OF EXHAUST PRESSURE). *(Haiki gasu sosei ni oyobosu taiki jotai no eikyo (haiki atsuryoku no eikyo)). Text in Japanese. Preprint, Japan Automobile Technical Assoc., Tokyo, 1974, p. 179-183, 1974. (Presented at the Japan Automobile Technical Association Lecture Meeting, Tokyo, Japan, May 1974, Paper 25.)*

The effect of exhaust pressure on the exhaust composition does not depend only on variations of the air-fuel ratio. When the exhaust pressure increases, the residue exhaust gas increases. The increased residue exhaust gas causes the intake temperature to increase, the ignition quickens, and the temperature around the spark plug becomes high. Emissions of nitric oxide are thus increased.

**40164** **APTIC NO. 63239**

Hamm, H. and F. Wirsching

RECENT WEST GERMAN PRODUCTION PLANTS FOR NATURAL AND CHEMICAL GYPSUM AT THE KANUF WORKS. *(Neuere westdeutsche Produktionsanlagen fuer Natur- und Chemiegips von Knauf). Text in German. Zement-Kalk-Gips (Wiesbaden), 27(5):226-229, 1974. 7 refs.*

The operations of the large technical production plants for natural gypsum and for chemical gypsum built in the last 10 years by Gebr. Knauf Westdeutsche Gipswerke are reviewed. The operation of a large production plant comprising one 1000 tons/day sintering grate and two 300 tons/day rotary kilns is described. The composition of flooring plaster, plaster of Paris, and anhydrite plaster produced is indicated. The sintering grate furnace with its endless grate band carrying the plaster with a speed of less than 20 m/hr through the burner produces very little dust. Measurements yielded a dust concentration of only 120 mg/cu m waste gas, so that no dust collectors are needed for this kiln. The sulfur trioxide concentration was 2 mg/cu m waste gas, and the sulfur dioxide concentration is also low. The rotary kilns (with a dust concentration in the waste gas of 18 to 30 g/cu m) are equipped with an electrostatic precipitator which cleans the gases to a residual dust concentration of 80 to 90 mg/cu m.

**40165** **APTIC NO. 63264**

Hartstein, Arthur M. and David R. Forshey

COAL MINE COMBUSTION PRODUCTS: IDENTIFICATION AND ANALYSIS. *Bureau of Mines Report of Investigations, Rept. RI-7872, p. 1-12, 1974. 1 ref.*

GPO

The identification and analysis of coal mine combustion products are presented. Tests were performed using a stagnation burner arrangement. Materials examined included those used in typical coal mining operations such as polyvinyl chloride containing materials; neoprene compositions; rigid foams; miscellaneous materials including jute, fiber glass, and polyethylene; coal, fluids such as phosphate esters, organic esters, and oil water emulsions; and composites. The composite comprised a mixture of a phosphate ester fluid with coal, a representative polyvinyl chloride sample, or a neoprene type composition. A number of decomposition products are identified that could represent a potential health hazard to miners including hydrogen chloride, carbon monoxide, sulfur dioxide, and hydrogen sulfide, if they were generated to exceed toxic levels. (Author abstract modified)

**40166** **APTIC NO. 64816**

Heindryckx, R. and R. Dams

CONTINENTAL, MARINE AND ANTHROPOGENIC CONTRIBUTIONS TO THE INORGANIC COMPOSITION OF THE AEROSOL OF AN INDUSTRIAL ZONE. *J. Radioanal. Chem., 19(2):339-349, 1974. 8 refs.*

Atmospheric aerosols above Ghent were collected on filter paper with turbine jet samplers and analyzed for composition by neutron activation analysis to yield more than 30, major, minor, and trace constituents. Samples were taken at seven sampling stations 0.2-2 km to the east of the major industries. When the wind came from the east, the samplers were not strongly influenced by local sources. The aerosols at the seven stations and at the control station south of town had similar compositions. The mean concentrations of 3 days gave total particulate levels of 200 micrograms/cu m. On another day with lower levels of most elements, total particulates were 59 micrograms/cu m. For a majority of elements the coefficients of variation as a measure of the reproducibility of composition was smaller than 50%; for these elements the concentrations varied only by a factor of less than 3.5. Exceptions probably came from sources in the north-eastern direction. The contributions of natural sources such as soil dust and ocean spray were estimated using aluminum as an index of soil derivation and sodium as an indicator of sea salt aerosols. A measure of anthropogenic contributions was given as the ratio of the total concentration to the natural (soil and marine) contribution. The ratio was the enrichment of the trace elements in aerosols. Concentrations and enrichments were compared for the same elements in clean air. The ratio of the enrichment factors for the Ghent aerosols to those of the real background station gave a measure for the pollution contribution. Most elements came from both natural and anthropogenic sources for both urban and remote areas. The local industrial contribution was determined. Titanium, manganese, chromium, iron, cobalt, and nickel enrichment was high due to several metallurgical industries. Rate earths were also enriched due to local emissions. Examination of the ratios of enrichment factors during days with winds from the western sector to the enrichment factors for the local background was used to identify the major local pollutants and to find the most strongly influenced sampling

**40167** **APTIC NO. 62980**

Hirst, Eric

POLLUTION CONTROL ENERGY COSTS. *Oak Ridge National Lab., Oak Ridge, Tenn., ORNL-NSF Environmental Program, National Science Foundation RANN Contract, 27p., 1974 (?). 39 refs.*

NTIS: Conf-731105-5

The amounts of energy needed for or saved by operation of several environmental protection strategies including air pollution abatement are examined. The major sources of air pollution in 1970 by weight were transportation 55%, stationary power sources 17%, industrial processes 14%, solid waste disposal 4%, and miscellaneous 10%. Legislated pollution control devices for automobiles will substantially reduce air pollution levels in both urban and rural areas. Substituting mass transit for autos in urban areas would reduce total energy consumption and thereby lower pollution levels further. The electricity requirement for 90% efficient particulate and 70% efficient sulfur removal at power plants, furnaces, cement plants, incinerators, and fossil fuel cleaning facilities was estimated at 26 billion kWhr/yr for 1970. To account for increasingly strict air quality standards, the air pollution control electricity consumption was arbitrarily increased by 50% to 39 billion kWhr/yr, 2.8% of 1970 consumption. This is in excellent agreement with the 3% figure estimated for 1980.

**40168** **APTIC NO. 63191**

Hwang, C. C., J. M. Singer, and T. N. Hartz

DISPERSION OF DUST IN A CHANNEL BY A TURBULENT GAS STREAM. *Bureau of Mines, Pittsburgh, Pa., Pittsburgh Mining and Safety Research Center, Rept. of Investigations 7854, 33p., 1974. 17 refs.*

A method is given for computing dust concentrations in a turbulent gas stream following explosion-induced entrainment of dust beds on mine surfaces. The dust concentrations from different source locations (floor, roof, and ribs) are additive, as are the concentrations from different entrainment rates of either stationary or moving sources. Both rectangular and circular ducts are considered. Solutions are given for several cases, assuming diffusion coefficients in the range of 25-100 sq cm/sec, and using the rates of entrainment determined in explosion tunnel experiments. The analysis predicts the dust concentration as a function of time and channel space. The results appear to agree with the physical characteristics of explosion-driven dust dispersion in a 0.6-meter diameter, 50-meter long explosion tunnel. The analysis is also applied to simultaneous and consecutive dispersion of coal and rock dust from simulated coal mine surfaces for which there are no measured observations. (Author summary modified)

**40169** **APTIC NO. 63190**

Krebs, J. and E. Ligazzolo

PROGNOSIS OF AIR QUALITY. *In: Air Hygienic Meteorological Model Studies of the Lower Main Region. Report 5. Regional Planning Assoc., Lower Main Region, Frankfurt am Main (West Germany), p. 218-233, June 1974. 15 refs.*

The future extent of air pollution depends primarily on the future consumption of primary energy. Based on the calculation of the future fuel demands in industry, domestic heating, and traffic, the emissions of sulfur dioxide, carbon monoxide, and dust for the year 1985 are calculated separately for the three sectors. The calculation was based on the assumptions that quality and sulfur concentration of the used fuels remained the same as in 1971. Possible measures for reduction of the emissions were not taken into account just as any possible retroactive effects of the energy crisis or of the recently enacted Immission Protection Act were not considered. The emissions anticipated for 1985 are listed in three tables. For calculating the future emissions by passenger cars a 5.8% increase of motorists by 1985 was assumed. For trucks the same growth rate was assumed. The results show a rise of the combined SO2 emission of the three sectors for 113,591.6 million kg in 1971 to 199,139.7 million kg in 1985, a decline of dust emission from 11,340.3 million kg to 10.980.7 million kg, and an increase of CO emission from 101,023.8 million kg in 1971 to 103,186.6 million kg in 1985.

**40170** **APTIC NO. 62893**

Krider, E. P., R. C. Noggle, M. A. Uman, and R. E. Orville

LIGHTNING AND THE APOLLO 17/SATURN V EXHAUST PLUME. *J. Spacecr. Rockets, 11(2):72-75, Feb. 1974. 22 refs.*

Survey spectra of the Apollo 17/Saturn V exhaust plume during launch were obtained in the ultraviolet, visible, and near infrared. The plume resembled a blackbody source for about 40 m from the exit plane, and beyond this point, the characteristic radiation was the radiation was the sodium D-lines. The spectral data supported previous reports that the peak exhaust temperature is near 2600 K, which in turn suggests the conductivity in the upper 40 m of plume is in the range of 10 to the -7th power to 10 to the -4th power mho/cm or higher. The effect of this conductivity is to significantly increase the Apollo 17/Saturn V electric field enhancement factor, which in turn increases the possibility that the vehicle will initiate lightning in an electrified environment. Such initiation of lightning occurred during the launch of Apollo 12. The composition of the exhaust is also discussed. (Author abstract modified)

**40171** **APTIC NO. 63246**

Kutenev, V. F., A. A. Charykov, and V. N. Topunov

COMPARATIVE ASSESSMENT OF THE TOXICITY OF DIESEL AND GASOLINE ENGINE VEHICLE EXHAUST GASES. *(Sravnitel naya otsenka toksichonosti otrabotavshikh gazov avtomobiley s dizelyami i s benzinovymi dvigatelyami). Text in Russian. Avtomob. Prom., no. 3:9-11, 1974. 3 refs.*

The carbon monoxide, hydrocarbon, nitrogen dioxide, and carbon emissions from diesel and gasoline engines were investigated in the European cycle in a comparative study of the specific emissions. Diesel engines emitted 10 to 20 times less CO than carburetor engines, 3.5-7 times less than prechamber diesels, and 3.5 times less than engines with direct fuel injection. The nitrogen oxides emissions from diesel and gasoline engines were of the same order of magnitude. Diesel engines emitted 4 times less hydrocarbons than gasoline engines.

**40172** **APTIC NO. 63224**

Leason, D. B.

PLANNING ASPECTS OF COOLING TOWERS. *Atmos Environ., 8(4):307-312, 437, April 1974. 14 refs. (Presented at the Symposium on Environmental Effects of Cooling Towers, Surrey, England, March 27-28, 1973, Paper 1.)*

This introductory paper briefly outlines the reason why cooling towers are needed, describes the principal features, and outlines the major environmental aspects of their operation. The use of cooling towers minimizes heat disposal into natural waters at the expense of heat and water vapor to the atmosphere. Questions have been raised as to the effect this has on local climatic conditions, but there is no evidence to date to indicate that the magnitude is sufficient to in any way influence the meteorology or ecology of the neighborhood. The escape of droplets above the eliminators and the presence of condensing water vapor both inside the tower and subsequently in the plume can give rise to droplet growth sufficient to cause fall-out from the plume. Provided eliminator installations are of high quality, the fall-out will be sufficiently controlled not to affect the neighborhood to any degree that is noticeable except by the use of sensitive detection techniques. Under high wind conditions droplets of cooling water can be swept out of the air inlet and are sometimes entrained in the tower wake, often up to a height of 30 m, and carried some distance downwind. No easy solution has been found to this particular problem. Because of the cooling process, an operating tower is topped by a plume of condensed water vapor, the length of which depends primarily on the humidity of the upstream air. When the humidity is high and the plume of substantial length, the combined effect of tower and plume can present a dramatic appearance. Only in some cases, fortunately rare in England, does a persistent plume occur in sunny conditions and hence the interference by the plume with sunshine in the neighborhood of the station is slight. Here again the problem presents no easy solution beyond the abandonment of the simple wet tower in favor of a dry tower or some hybrid of the two types. The dry tower in which the cooling water passes through a heat exchanger has several handicaps.

**40173** **APTIC NO. 63183**

Ligazzolo, G.

EMITTERS AND EMISSIONS. *In: Air Hygienic Meteorological Model Studies of the Lower Main Region. Report 5. Regional Planning Assoc., Lower Main Region, Frankfurt am Main (West Germany), p. 14-47, June 1974.*

Work for the emission inventory began in 1970 and was divided into three groups, industry, domestic heating and traffic. Questionnaires with 31 questions, many sub-questions, and two tables were sent out to 800 enterprises with firing systems of more than 800,000 kcal/hr. The data obtained through the questionnaires were evaluated with a computer. Domestic heaters and firing-systems of smaller trades were registered with the aid of the books of the district chimney sweeps and by local inspections. They were regarded as area emitters. The domestic fuel requirement was calculated per cu m of living space. With regard to traffic, the automobile emissions of the cities of Frankfurt and Hanau, the boat emissions on the Main river and the emissions by air traffic at the Rhine-Main airport were included in the study. The sulfur dioxide and carbon monoxide emissions from automobiles and boats were determined. For airplanes, only CO was measured. The emissions for the three sectors industry, domestic heating, and traffic are listed in a table. Industry emitted a total of 91,093 million kg SO2/a and 4,796.8 million kg dust/a, domestic heaters 22,007.8 million kg SO2/a, 6,543.5 million kg dust/a and 38,342.0 million kg CO/a, and traffic 491.8 million kg SO2/a and 62,600.9 million kg CO/a.

**40174** **APTIC NO. 63129**

Littman, Fred E., Sylvan Rubin, Konrad T. Semrau, and
Walter F. Dabberdt

A REGIONAL AIR POLLUTION STUDY (RAPS) PRELIMINARY EMISSION INVENTORY (FINAL REPORT). *Standard Research Inst., Menlo Park, Calif., Environmental Protection Agency Contract 68-02-1026, Rept. EPA-450/3-74-030, 187p., Jan. 1974. 34 refs.*

NTIS: PB 232223/AS

A regional air pollution study preliminary emission inventory report is presented describing an operational plan for providing emissions data for the Saint Louis Regional Air Pollution Study. The report also describes existing emission inventories for the Saint Louis area and reviews in detail emission models that have in the past been used to provide emissions data. Tasks of the report include: definition of potential users and uses, emission inventory content, emission inventory file system, survey and evaluation of existing emission inventory data, and emissions modeling. Appendices are included and provide sample emission inventory printouts and a summary of emission model reports.

**40175** **APTIC NO. 60995**

Maarse, H. and M. C. Ten Noever de Brauw

ANOTHER CATTY ODOUR COMPOUND CAUSING AIR POLLUTION. *Chem. Ind. (London), no. 1:36-37, Jan. 5, 1974. 6 refs.*

A study was made of the identity of a compound causing catty odor in the Rijnmond district in the western part of the Netherlands. Since a tertiary dodecylmercaptan manufacturing plant was the suspected source of the odor, a sample of raw tertiary dodecylmercaptan was analyzed. The fraction responsble for the catty odor was condensed and analyzed by gas chromatography and mass spectrometry. After analysis, the compound causing the odor was determined to be 2-methyl-2- mercaptopentane.

**40176** **APTIC NO. 64685**

Marchal, D.

THE FORMATION OF SOOT FLAKES. A BIBLIOGRAPHIC STUDY. *(Die Bildung von Russflocken. Eine bibliographische Studie. Text in German. Oel Gasfeuerung, 19(4):288-298, 1974. 73 refs.*

Soot flakes are an agglomeration of solid or liquid substances which are emitted by oil-fired furnaces. They can be divided four categories, into acid-containing soot flakes, into hollow carbon balls (zenospheres), into carbon balls with liquid nucleus and into solid carbon balls. The size of these particles ranges from 50 to 500 micron. The term soot flake connotes the first category, the other three are residues from an incomplete combustion of oil droplets. Soot flakes form preferably on walls. The mechanism which leads to the formation of these soot flakes is reviewed. Little is known about the emitted quantity of soot flakes. For a mathematical model permitting the calculation of the quantity of soot flakes emitted from a certain furnace as well as their size and composition, the formation of pollutants in the combustion chamber and the reactions taking place behind the combustion must be known apart from data concerning the furnace design and operation which can be supplied easily. Least knowledge seems to exist on the formation of pollutants in the combustion chamber. The reaction kinetics and temperature distribution inside the combustion chamber are so complex that they cannot yet be described by equations except with the aid of distorting simplifying assumptions. Also, very little is known about the condensation kinetics.

**40177** **APTIC NO. 63226**

Martin, A. and F. R. Barber

MEASUREMENTS OF PRECIPITATION DOWNWIND OF COOLING TOWERS. *Atmos. Environ., 8(4):373-381, 437, April 1974. 14 refs. (Presented at the Symposium on Environmental Effects of Cooling Towers, Surrey, England, March 27-28, 1973, Paper 8.)*

Droplets of water falling from cooling tower plants have been collected on water-sensitive papers around several power stations at various distances and in different weather conditions. Details are given of the deposition rates and drop sizes found in particular cases. Before the Ratcliffe towers were modified, road-wetting was observed, both on- and off-site, from this carry-over water. Bulk samples of the drizzle were collected for chemical analysis when the deposition was heavy, to compare with the tower water and with natural rainfall. After the Ratcliffe tower eliminators were modified, the deposition was considerably reduced and road-wetting could no longer be detected. The deposition-humidity relationships found indicate that road wetting is now unlikely to occur. (Author abstract)

**40178** **APTIC NO. 63382**

Martin, R. R., F. A. Manning, and E. D. Reed

WATCH FOR ELEVATED DEW POINTS IN SO3-BEARING STACK GASES. *Hydrocarbon Process., 53(6):143-144, June 1974. 8 refs.*

Elevated dew points in sulfur trioxide-bearing stack gases are discussed in relation to heat recovery performance, stack emissions, and previously reported SO3 dew points. Severe sulfuric acid corrosion can occur within the furnace structure, thus lowering heater efficiencies, if the dew point is reached in the furnace itself or prior to emergence from the stack; if the dew point occurs after departure from the stack, a plume of blue-gray sulfuric acid vapor trails from the stack. A corrected dew point correlation for dilute mixtures of SO3 with various water contents is given based on a previous correlation for high SO3 concentration and research at lower SO3 concentrations. Great care must be exercized in choice of flue gas temperatures across the air preheater section and temperature of the gases exiting the stack when low sulfur fuels are being burned, which in turn give low SO3 concentrations.

**40179** **APTIC NO. 61386**

Mizukami, Y.

EFFECTS OF AIR POLLUTION CONTROL DURING THE YEARS 1955-1973 IN SAPPORO CITY. *(Sapporo-shi no taiki osen (baien) taisaku 20 kanen no seika). Text in Japanese. Kuki Seijo (Clean Air - J. Japan. Air Cleaning Assoc., Tokyo), 11(7):37-49, Jan. 1974. 14 refs.*

Air pollution in Sapporo has paralleled the fuel consumption in recognizable stages since 1955. Pollution was due then to incomplete combustion of the coal used in domestic, commercial, and industrial boilers. Heavy oil was substituted for coal in industrial boilers and kerosene was used for domestic heating in 1961. Beginning in 1965, automobile exhausts added nitrogen oxides, among other pollutants, and photochemical reactions increased the air pollution problem. The relationship between emissions of smoke and dusts and fuel consumption was studied. Since 1965 the frequency and duration of days with less than 500 m visibility have been recorded. Dust decreased in 1967 and visibility improved. Sulfur oxide concentrations decreased after 1966, but industrial and urban areas still are highly polluted. Vertical measurements of smog were taken in various meteorological conditions. Ground smog begins to disintegrate about 9 am, rises rapidly, and diffuses both horizontally and vertically around 10:30 am when ground visibility improves. Smog damages cost each citizen $10/yr. Mortality from respiratory disease is pronounced, and deaths from lung cancer are double the national average.

**40180** **APTIC NO. 64683**

Oshida, Naoichi and Hidenori Nishihama

BAD ODOR MEASUREMENT AND CONTROL MEASURES FOR INCINERATION OF WILD DOGS AND STOCKYARD SLUDGES. *(Yaken oyobi tojo odei no shokyaku shori ni okeru shuki sokutei to taisaku). Text in Japanese. Akushu No Kenkyu (Odor Research J. Japan), 3(15):39-46, June 1974. 1 ref.*

The incinerator described comprises a lower combustion at 430 - 600 C and an upper chamber at 820 - 970 C. Wild dogs were burned with kerosene one day after they were killed. About 10 l of the combustion gas was sampled in plastic bags from the top of the stack using a diaphragm pump with a silicon tube. No noticeable differences were found among sample gases collected from plain kerosene combustion gas, combustion gases sampled immediately, and gas sampled 15 min after the wild dogs were burned. The average degree of odor was 23 which was minor. Dehydrated sludge from a stockyard was burned and combustion gases were analyzed. The odor concentrations of the combustion gases from plain combustion, 20 kg of sludge after 20 min of combustion, and 40 kg of the sludge after 20 min and 40 min of combustion were 100, 600, 600 and 200, respectively. The odor concentrations were negligible compared to that of the sludge. The characteristics of the incinerator were a completely closed system and two-stage combustion, by which the offensive odors were decomposed.

**40181** **APTIC NO. 63218**

Popendorf, William J. and Robert C. Spear

PRELIMINARY SURVEY OF FACTORS AFFECTING THE EXPOSURE OF HARVESTERS TO PESTICIDE RESIDUES. *Am. Ind. Hyg. Assoc. J., 35(6):374-380, June 1974. 4 refs.*

A survey was conducted in the Central Valley of California among harvesters of grapes, oranges, and peaches. A comparison was made among factors which might affect their exposure to pesticide residues, such as the age and sex distribution of work crews, their apparel and work practices as related to foliar contact, and exposure to airborne particulates. Recurring high values of airborne particulates suggest that contaminated dust is the primary vehicle for residue exposure. The airborne dust concentrations in the grape, peach, and orange fields were 13.5, 28.6, and 40.2 mg/cu m, respectively, and geometric mean particle sizes were 1.8, 2.3, and 3.1 micron, respectively. (Author abstract modified)

**40182** **APTIC NO. 63325**

Poppoff, I. G., N. H. Farlow, and L. B. Anderson

STUDIES OF AIRCRAFT WAKE CHEMISTRY AND DISPERSION. *Acta Astronaut., 1(1-2):157-178, Jan.-Feb., 1974. 66 refs.*

The use of aerospace technology to study aircraft wakes is reviewed. Models of aircraft near field exhaust wakes are characterized by jet, vortex, and dispersion regimes. Wake diffusion in the dispersion regime is initially influenced by aircraft-induced turbulence, but is dominated later by small-scale atmospheric turbulence. Jet emissions include unreacted constituents from the ambient air, products of complete and incomplete combustion, nitrogen oxides produced by high temperature reactions between atmospheric oxygen and nitrogen, and constituents due to trace elements in the fuel. Since jet engines operate at near 100% efficiency during cruising, products of incomplete combustion are low in concentration, but NOx are high because of high engine temperature. The influence of photochemistry on certain products in an undiluted hypothetical wake causes significant chemical changes. Concentrations of NOx and carbon monoxide in tens of thousands of ppb are found near airfields. Available instruments are adequate for making near field wake measurements. Problems limiting the application of aerospace technology to atmospheric studies include chemical reaction rate uncertainties, measurement platform limits and availability, and certain gas and aerosol measurement difficulties. (Author abstract modified)

**40183** **APTIC NO. 64712**

Pritchard, N. A.

**REFUSE INCINERATION PLANT, BARNFIELD ROAD, SWINDON.** *Inst. Munic. Eng., 101:153-156, June 1974.*

A report of a refuse incineration plant in Swindon, England, is presented. Consideration was given to the size of the plant, cost, environmental aspects, recovery of by-products, and waste heat recovery. A study was done on possible fallout of toxic gases and dust. Tests were conducted at other incinerators and concentrations of hydrochloric acid, burning rates of polyvinyl chloride, chimney heights and weights of solid emissions were investigated together with analysis of typical emissions. Description of the plant is presented, including refuse intake, furnace feeding, waste heat boilers, flue gas cleaning, and residue handling.

**40184** **APTIC NO. 63291**

Pulz, F.

**IS THERE A FUTURE FOR CARS?** *(Hat das Auto noch Zukunft)? Text in German. Oesterr. Ing., Z., 17(4):113-121, April 1974.*

Considerations on the future of automobiles as a means of private transportation are presented. The car has become a status symbol, and a token of freedom and independence, wherefore it is extremely difficult to induce car owners to abandon their cars in favor of public transportation. On the other hand, public transportation and railroads are unable to meet the modern transportation and shipping needs. While it is impossible to make conventional cars non-polluting, electric- and natural gas-driven vehicles with reduced pollutant emissions are being increasingly developed for public transportation. The rising gasoline costs will likely reduce the use of cars and make public transportation more attractive, thus indirectly contribute to the reduction of traffic-generated emissions.

**40185** **APTIC NO. 64699**

Rainey, Reginald C.

**UTILISATION OF ATMOSPHERIC PROCESSES IN THE DISTRIBUTION OF PESTICIDES.** *Chem. Ind. (London), no. 5:199-201, March 2, 1974. 21 refs.*

While in some circumstances, distribution of airborne pesticides by atmospheric processes, particularly wind and turbulence, can result in serious hazards of misplacement, in other circumstances these atmospheric processes have been deliberately exploited, by appropriate spraying techniques (from air or ground), to give significant improvements not only in effectiveness and economy, but at times also in reduced environmental contamination. The use of atmospheric processes in the distribution of pesticides is discussed. This approach can be used in early drift-spraying against locusts, in vegetation-baiting for locust control, in drift-spraying against armyworm on rangeland, and in ultra-low- volume spraying. Track-guidance systems for ultra-low-volume spraying are also discussed.

**40186** **APTIC NO. 63229**

Richards, D. J. W.

**ENGINEERING RESEARCH ASPECTS OF ASSISTED DRAUGHT COOLING TOWERS.** *Atmos. Environ., 8(4):425-432, 437, April 1974. 14 refs. (Presented at the Symposium on Environmental Effects of Cooling Towers, Surrey, England, March 27-28, 1973, Paper 13.)*

The development of the assisted draught cooling tower has involved a detailed consideration of the effects of the tower on the environment and vice versa. In this context some of the results of the studies of droplet carryover (drift), the effects of high winds on water stripping, blowout, and tower performance, plume behavior, fan noise, and ice accretion at the air inlet are outlined. While the use of assisted draught cooling towers ameliorates some environmental effects, the adoption of stringent environmental requirements can lead to excessive cost penalties. (Author abstract)

**40187** **APTIC NO. 64698**

Scharf, Allan

**AIRBORNE DUST PRODUCED BY PNEUMATIC JACKPICK: V. VISIBLE DUST/ STEAM CLOUDS AND CONCENTRATIONS.** *Am. Ind. Hyg. Assoc. J., 35(7):433-437, July 1974. 5 refs.*

In sandstone trenches, pneumatic jackpicks fitted with water attachments, but using an insufficient quantity of water, producing clearly visible dust/steam clouds from the impact point of pick steels. When such clouds were visible, the concentrations of hazardous dust particles were significantly greater than when sufficient water was used and no clouds were seen. The probability of exceeding the maximum allowable concentration of harmful dust was 77% when dust/steam clouds were seen and less than 1% when no clouds were seen. Observing the presence or absence of dust/ steam clouds provided a simple, yet valid, method of assessing harmful dust concentrations. (Author abstract modified)

**40188** **APTIC NO. 64926**

Schoenmaker, Oswald Dirk and Jacobus Philippus Guldenmundt

**USE OF PUROFER SPONGE IRON IN A 35-TON ELECTRIC ARC FURNACE.** *(Einsatz von Purofer-Eisenschwamm in einem 35-t-Elektroofen.) Text in German. Stahl Eisen (Duesseldorf), 94(16):711-728, Aug. 1974. 3 refs.*

The emissions from the charging of sponge iron in an electric furnace were examined. Dust emission measurements were taken in the suction tube 26m from the furnace. The furnace waste gases are afterburned and cooled by surplus air. The first portions of the suction tube are water cooled. At the measuring point the temperature was 500 to 700 C. During scrap melting a maximum of 10 to 14 g of dust/cu m and an average of 6 g/cu m were measured. The continuous addition of sponge iron increased the maximum values to 20 to 21 g dust/cu m and the average to 9.0 g/cu m at a sponge iron fraction of 72 to 80%. Of the measured dust during sponge iron melts 60% had a grain size of less than 5 micron, while this fraction was only 30% during scrap melts. Understandably the fractions of silica, alumina, and titanium dioxide, as well as calcium oxide and magnesium oxide were higher during the treatment of sponge iron while the fractions of tin, zinc, lead, manganese, sodium oxide, fluorine, and water soluble chlorine were low.

**40189** **APTIC NO. 64673**

Takahashi, Hiroshi

**RECENT PROGRESS OF ANTI-POLLUTION TECHNOLOGY FOR PAINT INDUSTRY.** *(Komakukei toryo ni okeru kogai taisaku gijutsu no shinten). Text in Japanese. Kobunshi Kako (Polymer Appl.), 23(2):12-18, Feb. 1974. 13 refs.*

This article surveys the ways in which paints and painting methods affect or are affected by pollution and pollution controls. Use of photochemically inactive aliphatic hydrocarbons instead of aromatic hydrocarbons as paint solvents is desirable. Rohm and Haas in the United States and ICI in Great Britain have developed such systems. Water-based paints such as emulsion polymerization dispersion paints, and water-soluble alkyd and acrylic paints have positive features such as ease of handling and the non- poisonous character of the solvent. However, there are drawbacks due to increased surface tension and latent heat of vaporization, and the hydrophilic nature of the paint. Cationic electrodeposition of paint has features superior to anionic deposition. Deposition can be accomplished on iron and copper without discoloration. Electrodeposition can be accomplished on extremely thin materials such as foil, and on extremely easily oxidizable metals. Among paints using no solvents, there are plastisols, paints which harden catalytically (unsaturated polyester resins and expoxy resins), and powdered paint. Powdered paints in commercial use include epoxy resin, acrylic resin, polyester resin, and vinly chloride resin. Merits include the range of paint film obtainable (80-500 micron), the variety of utilizable resins, applicability to electrodeposition and flow immersion painting techniques.

**40190** **APTIC NO. 63272**

Takishita, Toshio, Nobuo Iwai, Masatake Yoshida, and Nobuharu Kobayashi

GAS COMPOSITION OF COMBUSTION AND EXPANSION PROCESSES IN EACH COMBUSTION CHAMBER OF SPARK-FIRING ENGINES-ESPECIALLY ON NITROGEN MONOXIDE. *(Haibana tenkakikan no nenshoshitsu kakubu ni okeru nensho, bocho katei no gasu sosei). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Tokyo, p. 131-134, 1974. 5 refs. (Presented at the Japan Society of Mechanical Engineers General Meeting, Tokyo, Japan, April 2-4, 1974, Paper 924.)*

The formation of nitrogen monoxide was studied in various areas of a spark ignition engine. The concentration of NO was measured by gas chromatography and mass spectrometry, both in the exhaust gas in each combustion chamber. The formation of NO varies with location, and the gas flow rates, mixing ratio, and gas temperature are important variables within the chemical reaction.

**40191** **APTIC NO. 61474**

Tokyo Metropolitan Government (Japan), Pollution Control Bureau

A SURVEY OF THE HATSUDAI INTERSECTION AFTER THE CITIZENS REQUEST FOR TRAFFIC CONTROL REGULATIONS. *(Hatsudai Rosaten ni kansuru kotsu kisei yoseigo no jokyo ni tsuite). Text in Japanese. 10p., Jan. 1974.*

The average carbon monoxide concentration of Hatsudai intersection in shibuya ward was higher than 10 ppm in July 1973. The average concentration increased gradually from 7.5 ppm in Jan. 1973 to 10.8 ppm in July of the same year. A request was made by the Public Safety committee in order to reduce air pollution caused by automobiles. The request included adjustment of traffic lights to cut traffic jams, speed-up of highway construction, and development of a two-level road at this particular intersection. Both a new highway and the two-level road were opened. Average CO concentrations were decreasing. to 8.5 ppm in Nov. and 8.4 ppm in Dec. 1973. Results of a survey showed that, in addition to the reduction of traffic jams, changes of the pattern of wind direction also contributed to the air pollution improvement.

**40192** **APTIC NO. 62897**

Environmental Protection Agency, Research Triangle Park, N. C., Test and Evaluation Branch

FUEL ECONOMY AND EMISSIONS FROM FIVE MEDIUM DUTY VEHICLES. *Rept. 74-28 DWP, 5p., April 1974.*

Five medium duty trucks were tested for fuel economy. The Dodge and Jeep vehicles demonstrated significantly better fuel economy than the other three vehicles tested (Ford, IHC, and Chevrolet vehicles). Additionally, the Jeep and Dodge had lower emissions (hydrocarbons, nitrogen oxides, and carbon monoxide) than the average of the five vehicles. The IHC vehicle demonstrated significantly worse high speed fuel economy than the other vehicles tested. The test results are presented. (Author summary modified)

**40193** **APTIC NO. 62939**

The Biomass Energy Inst., Inc., Winnipeg (Manitoba)

THE RENEWABLE BIOMASS ENERGY GUIDEBOOK. *40p., March 1974. 132 refs.*

The implications of present energy sources to the environment are discussed. Air pollution resulting from power generation is widespread. Pollution from a given fuel source is not inevitable, but is the result of its mode of application. Pollution from a given fuel results either from its incomplete use or from failure to invest in pollution control devices. The burning of fossil fuel is releasing carbon dioxide at a rate many times that at which it is being fixed. This effect is unclear, with both harmful and beneficial aspects. It is possible that the total biomass on earth may have been increased as much as 15 billion tons/yr on the basis of the increased CO2 level in the atmosphere. It is estimated that with the predicted consumption of fossil fuel, the atmospheric CO2 will eventually rise to a peak concentration of from 375-400 ppm.

**40194** **APTIC NO. 63066**

Environmental Protection Agency, Washington, D. C., Office of Public Affairs

THE 1974 GAS MILEAGE GUIDE FOR CAR BUYERS. FUEL ECONOMY TEST RESULTS FOR AUTOMOBILES AND LIGHT-DUTY TRUCKS. *8p., Feb. 1974.*

GPO

Fuel economy results are listed for 1974 automobiles and light-duty trucks tested by the Environmental Protection Agency. All 486 vehicles listed met the 1974 Federal Pollution Emission Standards. This list represents approximately 96% of the 1974 vehicles which will be tested and is the final list expected to be published.

**40195** **APTIC NO. 63297**

MINISTRY OF NATURE CONSERVATION AND ENVIRONMENTAL PROTECTION. DIRECTIVES OF JAN. 14, 1974, ON ROAD COATING MATERIAL-PROCESSING PLANTS. *(Ministere de la protection de la nature et de l environnement). Text in French. Pollut. Atmos. (Paris), 16(61):110-117, Jan.-March 1974.*

New regulations concerning the pollutant emissions from stationary and mobile road asphalt processing plants are presented. Maximum allowable dust emissions from stationary and mobile plants are set as a function of capacity and the distance from inhabited buildings and residential areas. The stack height should be calculated according to the Aug. 1971 instruction, providing for a minimum discharge velocity of 8 m/sec. Continuous dust concentration and dustfall measurements around asphalt processing plants are required. Coarse dust generated in asphalt processing plants is separated by cyclones and multicyclones of high efficiency. Cyclones are, however, practically ineffective for finer dust fractions. The use of scrubbers is impeded by the high water comsumption and by the problem of sludge disposal. Bag filters permit a residual dust concentration of 0.050 g/N cu m.

**40196** **APTIC NO. 63402**

THE 1975 REGULATIONS ON AUTOMOTIVE EXHAUST GASES. *(Jidosha haishutsu gasu Showa 50-nen kisei). Text in Japanese. Kankyo Kenkyu (Environ. Studies), no. 6:42-46, May 1974.*

The total number of automobiles in Japan as of 1972 was over 23 million, five times more than the total automobiles in 1963. This represents the second largest growth for automobiles in the world next to the United States. As of May 1973, every newly produced automobile is required to have an exhaust gas attenuation device for decreasing hydrocarbons and nitrogen oxides emissions. For hot cycle (10 modes) gasoline or liquefied petroleum gas automobiles of less than 10 passengers should control the emission gases to less than 2.70 g/km of carbon monoxide, less than 0.39 g/km of HC, and less than 1.60 g/km of NOx. For 11-mode vehicles of the same size, the above figures are 85 g CO for the total mileage of one driving, 9.50 g of HC, and 11 g of NOx. These figures represent a reduction of 95% for CO compared to before any emission standards were set, a 92% reduction for HC, and a 61% reduction for NOx. The total CO emission will decrease after the peak of 918,000 tons in 1974 to 741,000 tons in 1977, which is the level of 1966 with 1/4 the automobiles. The peak for HC emissions was 211,000 tons of 1972, and will reduce to 102,000 in 1977, which will be the level equivalent to that of 1965 with 1/5 of the present number of automobiles. The peak for NOx emission will be 201,000 in 1974, and this level will be sustained regardless of increases in the number of automobiles in the future.

## 1973

**40197** **APTIC NO. 64640**

Bathke, H., L. van Heyden, and K. Wienke

MEASUREMENTS OF THE OXIDES OF NITROGEN IN COMBUSTION WASTE GASES FROM BOILERS. *(Stickoxidmessungen in Feurungsabgasen von Kesselanlagen). Text in German. Brennstoff-Waerme-Kraft, 26(1):20-26, Jan. 1973. 10 refs.*

Results of measurements of the concentration of oxides of nitrogen in the waste gases from gas-fired heating boilers are presented. Nine different burners operated with light and heavy natural gas and coking gas and, in addition, three burners for light fuel oil were examined. The cast iron test boiler suitable for central heating a 12-unit apartment house had a heat capacity of 0.2 Gcal/hr. Parallel to these examination eight flame tube boilers heated with natural gas were studied. Their heat capacities ranged from three to 10 Gcal/hr. For the central heating boiler operated with light and heavy natural gas and coking gas oxides of nitrogen concentrations between 85 and 145 g/Gcal, and the average of 110 g NOx/Gcal, were measured. The results of the three different gases differed very little. Flame tube boilers fired with light natural gas yielded values between 125 and 270 g NOx/Gcal, average 210 g NOx/Gcal. In gas-fired boilers only thermal nitric oxide formation leads to formation of the oxides of nitrogen. For this, temperatures above 1600 C are necessary. Through measurements in flame tube boilers, where waste gas was drawn off at points shortly before its entry into the stack as well as on the flame tube ends, it could be confirmed, that those quantities of NOx which formed in the high temperature zones neither increased nor decreased on the further path through the boiler. This is in agreement with the familiar theory of the formation of oxides of nitrogen. The measurements were taken with a chemiluminescence unit. Experiences with the waste gas sampling system are briefly discussed.

**40198** **APTIC NO. 64541**

Blinov, K. A., Y. D. Verbitskiy, Y. Y. Borisov, S. G. Afanas ev, and F. Ye. Dubinskaya

INVESTIGATIONS OF THE DUST CONTAMINATION OF CONVERTER GASES CAUSED BY THE USE OF MULTIPLE NOZZLE LANCES. *(Issledovaniye zapylennosti konverternykh gazov pri primenenii mnogosoplovykh furm). Text in Russian. Stahl (Duesseldorf), no. 6:505-506, 1973.*

The effect of the use of multiple-nozzle oxygen lances for steel converters on the concentration and composition of dust entrained by the converter gases during blowing was studied. Oxygen lances with 3, 7, and 13 nozzles were used in a 10 ton-converter, and the blow rates were 4 or 7 cu m/ton/min. In converters with a three-nozzle lance, the dust concentrations ranged from 87.2 g/cu m (blow rate 4 cu m/ton/min) to 126 g/cu m (7 cu m/ton/min). The corresponding concentrations for 7-nozzle lances were 102 and 120.5 g/cu m, and a dust concentration of 427 g/cu m was determined for a 13-nozzle lance at 4 cu m/ton/min. The dust entrainment, related to the batch weight, was highest for the 13-nozzle lance at 3.58%. Regardless of the blow rate and the number of the nozzles used, 65-66% of the dust was composed of iron. The use of multiple-nozzle lances increased the melting losses, which can be counteracted by exposing the converter to acoustic energy for the coagulation of the dust particles in the zone below the lance.

**40199** **APTIC NO. 63373**

Borthwick, E. S.

LEAD EMISSION FROM EXHAUST FUMES. *Chem. N. Z., 37(6):199-201, Dec. 1973. (Presented at the Symposium on Heavy Metals in the Environment, Auckland, New Zealand, Oct. 17, 1972.)*

The technology and use of lead as an anti-knock additive and lead emission from exhaust fumes are discussed. Tetraethyl lead has been used in gasolines in New Zealand since the 1930s. The amount of lead emitted depends on driving conditions, and can be from 25 to 75% of the lead in the fuel. Lead is a natural constituent of the earth s crust and is naturally present in the environment; lead content along roadways is high; and lead occurs in the ir over urban areas due to industrial sources and motor vehicles. Lead absorption in man results from a combination of inhaling lead particles in the air and ingesting lead in food and drink. The most commonly used yardsticks of total lead exposure are concentrations in blood and urine. Although no valid evidence of a hazardous effect of lead additives exists, some persons are still concerned over chronic effects. The average absorption of lead by man is 46 micrograms/day, of which 10 micrograms comes from urban air. Therefore many countries are limiting lead concentrations in gasoline. However, more research is needed to determine the genuine hazard arising from possible environmental and health effects.

**40200** **APTIC NO. 63046**

Brinkerhoff, Ronald J. and William C. Achinger

THE BRAINTREE, MASSACHUSETTS, MUNICIPAL INCINERATOR. *Environmental Protection Agency, Washington, D. C., Office of Solid Waste Management Programs, Rept. SW-108, 94p., 1973. 9 refs.*

NTIS: PB 226960

Results are presented from a study of the Braintree Municipal Incinerator designed to obtain air pollution emissions data that will help the Environmental Protection Agency to establish National Emission Standards for municipal incinerators processing greater than 50 tons/day. Another objective was to evaluate the effect of plastic wastes on the operation of the facility, particularly with respect to stack emissions. The incinerator has two independent traveling grate furnaces of waterwall construction, with each furnace being designed to burn 120 tons/24 hr day of 5000 Btu/lb municipal solid waste. Both furnaces have electrostatic precipitators to control particulate emissions. Average carbon dioxide concentration in the stack gas was calculated at 9.0%, and particulate emissions averaged 0.15 gr/scf at 12% CO2, 0.25 lb/100 lb flue gas at 50% excess air, 35.5 lb/hr, and 3.4 lb/ton waste. Visible emissions were greater than or equal to 20% opacity 18.3% of the time when Armorflex was burned. Hydrogen chloride concentration in the stack gas was 487 ppm.

**40201** **APTIC NO. 64844**

Broetzenberger, Heinz

THE EMISSIONS FROM DOMESTIC HEATERS AND FROM FIRING SYSTEMS OF SMALL TRADES, POSSIBILITIES OF EMISSION REDUCTION. *(Die Emissionen aus Feuerungen von Hausbrand und Kleingewerbe. Moeglichkeiten zur Emissionsverminderung). Text in German. Gas Wasser Waerme, 27(11):216-222, 1973.*

Emissions from domestic heaters and from firing systems of small trades are characterized by many numerous small sources distributed over a large area and by relatively low chimneys. After a historical review of the development of heating systems in the past and measures to prevent smoke emission, the complete and incomplete combustion of solid, liquid, and gaseous fuels is discussed. The quantity of pollutants emitted by domestic heaters is a function of the type and quantity of the fuel, of the heating system, and its method of operation and maintenance. The dust emission from domestic heaters in Austria has not yet been measured but the sulfur dioxide emission has been quantitatively determined within the years 1960 to 1969. While in 1965 the SO2 emission was still 68,000 tons/annum, it was only 60,000 tons/annum in 1969. This reduction is mainly due to the increased use of liquid fuels. By 1975 it is expected that the SO2 emission will have climbed to 87,000 tons/annum. In Vienna the estimated SO2 emission rose from 32,000 tons in 1968 to 45,800 in 1971. As methods for reducing the SO2 emission the use of low-sulfur fuels, an optimum combustion, and a reduction of the heat demand are suitable.

**40202** **APTIC NO. 62902**

Harrington, J. A. and R. C. Shishu

A SINGLE-CYLINDER ENGINE STUDY OF THE EFFECTS OF FUEL TYPE, FUEL STOICHIOMETRY, AND HYDROGEN-TO-CARBON RATIO ON CO, NO, AND HC EXHAUST EMISSIONS. *Preprint, Society of Automotive Engineers, Inc., New York, 9p., 1973. 16 refs. (Presented at the Society of Automotive Engineers, Automobile Engineering Meeting, Detroit, Mich., May 14-18, 1973, Paper 730476.)*

The effect of variation in fuel composition on exhaust emissions from a single-cylinder engine was studied with eleven different fuels. Exhaust emissions, at fixed engine speed and load, were measured over a range of air-fuel ratio settings. At identical air-fuel values, carbon monoxide, hydrocarbons and nitric oxide emission varied significantly from fuel to fuel. At the same equivalence ratio, CO emissions were identical for all fuels. However, at fixed equivalence ratios, both NO and HC decreased with increasing fuel hydrogen-to-carbon ratio. (Author abstract)

**40203** **APTIC NO. 62930**

Janus, J. B. and B. S. Shirley

ANALYSES OF TIPPLE AND DELIVERED SAMPLES OF COAL COLLECTED DURING FISCAL YEAR 1972. *Bureau of Mines, College Park, Md., Coal Sampling and Inspection, RI 7712, 20p., 1973. 25 refs.*

GPO

Analytical data on the composition and quality of tipple and delivered samples of coal collected during fiscal year 1972 are presented. Mines located in 20 states are listed. Ultimate analyses are given for most of the coalbeds listed and include; ash, sulfur, hydrogen, carbon, nitrogen, and oxygen. Tipple samples were collected at tipples as coal was being loaded into railroad cars or trucks. The deliveries were sampled in accordance with the instructions issued by the Bureau of Mines, and the samples were aalyzed by the Bureau.

**40204** **APTIC NO. 63274**

Kato, Kunioki and Tadaaki Kimoto

THE TECHNOLOGICAL DEVELOPMENT IN ELECTRICAL POWER INDUSTRY AND AIR POLLUTIONS BEFORE WORLD WAR II IN JAPAN -- ESPECIALLY IN OSAKA. *(Senzen no karyoku hatsuden gijutsu no hattatsu to taiki osen). Text in Japanese. Kagagusi Kenkyu (J. Hist. Sci.), 12(108):210- 218, 1973. 40 refs.*

In Japan, the electrical power technology has been developed since electric light industries were founded in the 1870 s. At least in the field of steam power generation, the more new phases of technological development, the more air pollution. For example, the Asakusa Central Steam Plant, which was highly praised as one of the monumental works of the Japanese power industry, discharged air pollutants heavily, and induced people to fight against air pollution. In the 1910 s when the electric power industry was greatly developing in Japan, a large quantity of air pollution was discharged in Osaka Prefecture. The cause was the adoption of the underfeed stoker by the Osaka Electric Light Co. In 1940, air pollutants fell over the roofs of the buildings of the Amagasaki primary school at a rate of 370 l/mo. One of the causes of this heavy dust fall was the introduction of pulverized-fuel burning at the Amagasaki Steam Plant. Although the increase of air pollution could have been forecasted and prevented by available technology, the industrialists did not exert their utmost efforts to decrease air pollution.

**40205** **APTIC NO. 63102**

Keairns, D. L., D. H. Archer, E. J. Vidt, and E. F. Sverdrup

EVALUATION OF THE FLUIDIZED-BED COMBUSTION PROCESS. VOLUME III: PRESSURIZED FLUIDIZED-BED BOILER DEVELOPMENT PLANT DESIGN. *Westinghouse Research Labs., Pittsburgh, Pa., Environmental Protection Agency Contract 68-02-0217, Proj. ROAP 21ADB-09, Program Element 1AB013, Rept. EPA-650/2-73-048c, 252p., Dec. 1973. 2 refs.*

NTIS: PB 232433/AS

Results are reported for a process evaluation of the pressurized fluidized-bed combustion (FBC) system for power generation. The results include: preliminary plans and a cost estimate for a 30 Mw pressurized FBC boiler development plant, identification of a project team and program to demonstrate fluidized-bed oil gasification/desulfurization for power generation on a 50 Mw plant, and evaluation of pressurized oil gasification for combined-cycle power generation. No problems are identified which preclude the development of pressurized FBC combined-cycle power plants and fluidized-bed oil gasification power plants which can generate electrical energy within environmental goals at lower energy costs than competitive systems.

**40206** **APTIC NO. 64829**

Mathieu, M. R.

ROAD TRAFFIC AND POLLUTION. *(Route et pollution). Text in French. Cah. Med. Inter-profess., no. 50:95-113, 1973. 14 refs.*

General problems of automotive exhaust emissions are discussed, studies on the effects of air pollutants, and regulations concerning maximum allowable air pollutant concentrations in France and the USA are described. Gasoline engine exhaust emissions contain carbon dioxide, water, carbon monoxide, nitrogen oxides, unburned hydrocarbons, and lead; diesel engine exhaust, less toxic than the former, contains nitrogen oxides and smoke. The CO and hydrocarbon formation in gasoline engines is highest at idling and during deceleration, while aldehydes are formed mainly during deceleration. Cruising and acceleration are responsible for most of the nitrogen oxides emissions, under conditions of high temperature and excess oxygen in the combustion chamber. Nitrogen oxides emitted by automobiles play an important part in the photochemical reactions leading to the formation of ozone, formaldehydes, acrolein, acetaldehyde, and peroxyacyl nitrate. Comprehensive analyses failed to reveal rubber and asbestos, used in tires and brake linings respectively, in the air.

**40207** **APTIC NO. 64585**

Mosier, Arvin R., Charles E. Andre, and Frank G. Viets, Jr.

IDENTIFICATION OF ALIPHATIC AMINES VOLATILIZED FROM CATTLE FEEDYARD. *Environ. Sci. Technol., 7(7):642-644, July 1973. 11 refs.*

Basic organic nitrogen compounds volatilized from a cattle feedlot and collected in dilute acid were characterized by direct gas chromatographic analysis of the acid solutions and gas chromatographic separation of the pentafluorobenzoyl derivatives of the malodorous volatiles. Various amines were identified, constituting about 2-6% of the basic material volatilized from the cattle feedlot relative to ammonia. Gas chromatographic retention times are given for each of amines identified as well as for ammonia. (Author abstract modified)

**40208** **APTIC NO. 56513**

Natusch, David F. S., Richard L. Davison, Robert E. Lamb, and John R. Wallace

TRACE METALS IN AIRBORNE PARTICLES. *Proc. Int. Clean Air Congr., 3rd, Duesseldorf, West Germany, 1973, p. C12-C14. 7 refs.*

Results are presented from the analysis of trace metals in fly ash particles collected at various points in the precipitator and stack systems of eight coal-fired power plants. One group of elements which included zinc, chromium, iron, manganese, silicon, magnesium, beryllium, and aluminum out of the 25 elements determined showed dependence of concentration on particle size in some of the samples investigated. Chromium, Mn, and Be exhibited marked increases in concentration in the smallest size fraction (1.06-2.06 micron) analyzed, and the remaining elements showed convincing increases in concentration with decreasing particle size. The data collected indicate that while existing particle collection devices may effectively remove the bulk of the fly ash, they are relatively inefficient for removing the most toxic elements. It also appears that estimates of toxic element emissions, based on undifferentiated samples of fly ash retained in the plant, may grossly underestimate actual emissions. It was also observed that the highest concentrations of many toxic trace elements are emitted in particles which deposit in the lungs.

**40209** **APTIC NO. 63354**

Noto, T. and T. Komukai

ON THE VARIATION OF EXHAUST INDIVIDUAL HYDROCARBON COMPONENTS OF THE AUTOMOTIVE GASOLINE ENGINE UNDER PART-LOAD CONDITIONS. *(Gasorin kikan no bubun fukaji ni okeru haishutsu tanka suiso sosei henka ni tsuite). Text in Japanese. Hokkaido Jidosha Tanki Daigaku Kenkyu Kiyo (Bull. Hokkaido Junior Coll. Automob. Technol.), no. 3:29-34, April, 1973. 6 refs.*

Experiments are carried out within the limit of 1000 to 3000 rpm in order to determine the density of various kinds of hydrocarbons present in the exhaust fumes by employing a single-cylinder engine under part-load conditions. Gas chromatography was used with a flame ionization detector and the emitted hydrocarbons included paraffins, olefins, aromatics, and naphthenes ranging from C1 to C8. A definite tendency toward the total emission of unburned hydrocarbons and individual hydrocarbon components which are affected by the number of engine rpms under part-load conditions is discussed.

**40210** **APTIC NO. 63210**

Sawyer, Robert F.

AIR POLLUTION CHARACTERISTICS OF AIRCRAFT ENGINES (PART III). *In: The Fluid Dynamics Aspects of Air Pollution Related to Aircraft Operation. California Univ., Berkeley, Dept. of Mechanical Engineering, Advisory Group for Aerospace Research and Development AR-55, p. 17, 19-25, 1973 (?). 1 ref.*

A survey on aircraft air pollution and related research efforts in NATO countries is described. The effect of aircraft emissions depends on the size of the area considered. Naturally, the effect decreases from an isolated environment to a source vicinity, to an air basin, to the entire atmosphere. Typical aircraft pollutants include carbon monoxide, oxides of nitrogen, hydrocarbons, sulfur oxides, oxygenated hydrocarbons, carbon dioxide, water, smoke, particulates, lead, metals, sulfur compounds, halogen compounds, and odors. Aircraft contributions to air pollution as a percent of the total in the U. S. in 1968 were 2.4% CO, 0.9% HC, 1.7% NOx, 0.1% particulate, and 0.03% SOx. The engine is the primary source of aircraft air pollution. Carbon monoxide and hydrocarbon emissions at lower power and nitric oxide emissions at high power are the most important immediate engine pollution problems. Current research on aircraft emissions, emission characteristics of engines, engine related problem areas in aircraft air pollution, and effects of equivalence ratios on emissions are mentioned.

**40211** **APTIC NO. 64593**

Trammell, William D.

THE ENERGY CRISIS AND THE CHEMICAL INDUSTRY. *(Chem. Eng., 80(10):68-82, April 30, 1973. 22 refs.*

The energy crisis and the chemical industry are considered in terms of the effects of government policies, technical developments, and economic constraints on chemical producers competing with energy users for necessary feedstocks and fuels. Pollution control requirements, such as lower sulfur dioxide emissions, are shifting fuel demand from relatively cheap and available high sulfur coal to cleaner fuels such as natural gas and low sulfur fuel oils. Synthetic natural gas made from low-end point petroleum fractions will play an increasingly larger role as environmental goals move toward zero SO2 emissions and could produce a shift toward heavier feedstocks, thus generating a closer association between the chemical industry and refining. Low-sulfur coals will also take on greater importance for direct utilization and gasification, with such a trend having a significant direct effect on chemical by-product production. The economics of the energy crisis are examined and indicate that total energy requirements will probably cost between $400-500 billion over the next 15 yr, roughly twice the current level of annual expenditures.

**40212** **APTIC NO. 63405**

Utsunomiya, Takahide

MEASUREMENT OF AIR POLLUTANT HYDROGEN SULFIDE IN TAKEFU CITY, MIMANO DISTRICT. *(Takefu-shi Mimano chiku no taiki osen ryuka suiso no sokutei (dainiho)). Text in Japanese. Fukui-ken Kogai Senta Nenpo (Annu. Rep., Fukui Environ. Pollut.), no. 2:29-42, Oct. 1973.*

Air samples were taken at three locations near a carbon disulfide plant and a cellophane manufacturing plant for hydrogen sulfide analysis. The membrane filter method was used. The average HS emission rate from the CS2 plant is 4.32 N cu m/hr and the rate from the cellophane plant is 0.3 cu m/hr. The levels of HS were very much affected by the wind direction, but on the leeward side, the level of pollution constantly stayed in the range of 20-100 ppb. On windless nights, the odor threshold at three measuring points was 20 ppb, but the level was presumed to increase on cloudy or drizzling days with no wind. The daily measurements are presented in graphs, and emission quantity and diffusion models were obtained mathematically. Metal corrosions of furniture, precious metals, tin roofs, television antennas, and drainage pipes are heavy in this area due to the high concentration of HS. Zinc pieces were exposed to the air for 19 days and 41 days and corrosion was analyzed by X-ray spectrophotometry analyzer.

**40213** **APTIC NO. 60506**

Groupement d Interet Economique, Paris (France)

PLASTIC PACKAGING WASTES AND WILDCAT DUMPS. *(Le conditionnement plastique et les dechets sauvages). Text in French. Enviplast, 6p., 1973 (?). 3 refs.*

General problems of littering and uncontrolled dumping of wastes, and of disposable plastic packaging wastes are discussed. While intense studies are being conducted on photodegradable and biodegradable plastic materials, existing formulations are practically non-destructible when dumped or disposed of on sanitary landfills. Incineration together with municipal refuse represents the best solution to the problem of plastic material disposal. Due to their high calorific value, plastic packaging wastes supply extra energy when incinerated in waste incinerators coupled with waste heat recovery units.

**40214** **APTIC NO. 60817**

Bureau of Mines, Bartlesville, Okla., Bartlesville Energy Research Center

ALDEHYDE AND REACTIVE ORGANIC EMISSIONS FROM MOTOR VEHICLES PART I--ADVANCED AUTOMOTIVE CONTROL SYSTEMS VEHICLES. (FINAL REPORT). *Office of Air and Water Programs Interagency Agreement EPA-IAG-0188(D), APTD-1568a, 90p., March 1973. 14 refs.*

NTIS: PB 224251/AS

The characteristics of aldehyde and reactive organic emissions from automobiles with prototype advanced emission control systems and the effects of ambient temperature on the emissions were investigated. Three of the six cars tested showed an increase in carbon monoxide and hydrocarbon emission with decreasing fuel aromaticity from 35 to 10%. There was a decrease in nitrogen oxides emission from the three vehicles from 13 to 20% when the fuel aromaticity decreased from 40 to 10%. Aldehyde emissions from the six vehicles ranged from 0.008 to 0.046 g/mi. Emissions increased as fuel aromaticity decreased from 35 to 10%. Emissions of CO, hydrocarbons, and NOx were lowest at 75 F ambient temperature. The emissions increased when the ambient temperature was either higher or lower than 75 F.

**40215** **APTIC NO. 63048**

Office of Emergency Preparedness, Washington, D. C., Interagency Working Group

THE POTENTIAL FOR ENERGY CONSERVATION. SUBSTITUTION FOR SCARCE FUELS. A STAFF STUDY. *110p., 1973. 45 refs.*

GPO

The potential for increasing the use of coal to generate electrical power between 1973 and 1985 is examined for the cases of minimal environmental constraints, strict adherence to proposed state implementation plans, and selective relaxation of secondary standards in state implementation plans. The potential savings in oil and gas are estimated at 2.6 million barrels per day in 1980 with no environmental standards in effect. Minimal environmental constraints would reduce the figure to 2.5 million, while strict adherence to proposed state implementation plans would result in a 1 million barrel per day savings of oil. Limiting factors are considered both in terms of environmental considerations and economic costs.

**40216** **APTIC NO. 63049**

Environmental Protection Service, Ottawa, Ontario (Canada), Air Pollution Control Directorate

A NATION-WIDE INVENTORY OF AIR POLLUTANT EMISSIONS FOR 1970. SUMMARY OF EMISSIONS FOR 1970 (FINAL REPORT). *Rept. EPS 3-AP-73-1, 19p., Jan. 1973.*

Estimates for 1970 nation-wide (Canada) emissions of the five primary air pollutants are summarized in terms of source category. Approximately 17.3 million tons of carbon monoxide were emitted in 1970, with gasoline-powered motor vehicles being thy largest single emitters and accounting for approximately 74% of the total. Industrial processes accounted for approximately 58% of the nation s total particulate emission of approximately 2.3 million tons annually. Approximately 7.2 million tons of sulfur oxides were emitted in Canada during 1970, with more than 5.4 million tons being produced by industrial processes. Motor vehicles were the largest source of hydrocarbons discharged, accounting for 2.0 out of 3.1 million tons Approximately 1.4 million tons of nitrogen oxides were emitted in 1970; transportation sources produced 62% and fuel combustion 32%.

**40217** **APTIC NO. 64556**

Federal Power Commission, Washington, D. C., Section of Fuel and Environmental Analysis

STEAM-ELECTRIC PLANT AIR AND WATER QUALITY CONTROL DATA FOR THE YEAR ENDED DECEMBER 31, 1969, BASED ON FPC FORM NO. 67 (SUMMARY REPORT). *Rept. FPC-S-229, 208p., Feb. 1973. 4 refs.*

GPO

This is a summary report based on findings from questionnaires filed for 654 steam-electric generating plants to determine their ability to perform reliably, comply with environmental control regulations, and progress made in limiting pollutant and thermal emissions. In terms of total heat content, coal supplied 58.5%, gas 28.4%, and oil 13.1% of the thermal energy from fossil fuels used by steam plants for generation of electricity. Coal is responsible for the bulk of the pollutant emissions by steam- electric plants. The regional distribution of air pollutants is almost directly proportional to the levels of coal consumption. The total power plant emission levels are in agreement with the National Air Pollution Control Administration figures for 1968, of 5.6 million tons of particulate emissions, 16.8 million tons of sulfur dioxide emissions, and 4.0 million tons of nitrogen oxides emissions. Assuming fixed charges of 15% on the capital costs, the total particulate control expenses per year would amount to 0.14 mills/kw hr generated in coal-fired units. A factor of increasing importance in the siting and operation of steam-electric plants is the disposal of large quantities of waste heat. The amount of heat to be disposed of depends on the type and efficiency of the plant, with the most efficient achieving about 40%. The majority of plants providing the major share of steam electricity employ once-through cooling using either fresh or saline water. The principle chemical additives reported for cooling water treatment were phosphate, lime, caustic, soda, alum, and chlorine, with the latter being used in the largest amounts. The total operating expenses for cooling water facilities in 1969 are reported.

## 1972

**40218** **APTIC NO. 64582**

Depew, C. A., M. J. Mann, and R. C. Corlett

TECHNICAL NOTE: A LABORATORY SIMULATION OF WOOD PYROLYSIS UNDER FIELD CONDITIONS. *Combust. Sci. Technol., 6(4):241-246, Dec. 1972. 8 refs.*

A laboratory simulation of wood pyrolysis under field burning conditions, in which the thermal environment experienced by burning fuel elements can be arbitrarily controlled, is performed to investigate possible parameters affecting particulate air pollution. The apparatus used is capable of imposing ranges of incident radiant flux and ambient air flow rate for a cylindrical wood specimen; outputs are the specimen weight loss rate and particulate air pollutant production rate. Observed combustion patterns of both plain and flame retardant Douglas fir doweling are independent of fuel conditions and retardant treatment at relatively high environmental temperatures. Combustor patterns are difficult to reproduce at lower temperatures and are very sensitive to flame retardant treatment. Flame retardant treatment under otherwise controlled conditions does not result in reduction of air pollutants. (Author abstract modified)

**40219** **APTIC NO. 62933**

Dupree, Walter G., Jr. and James A. West

UNITED STATES ENERGY THROUGH THE YEAR 2000. *Dept. of the Interior, Washington, D. C., Dec. 1972, 71p.*

GPO

The results of comprehensive studies and analyses of the probable future energy consumption within each of the major consuming sectors and for each of the energy supply sources are presented. Technological, environmental, social, and other factors influencing future energy consumption were assessed and factored into the forecast and the most probable trends were identified and quantified. The major change in energy technology expected between now and 1985 is development of commercial techniques for coal gasification and liquefaction and control of sulfur oxide emissions. This forecast assumed that the problems of SOx emissions from coal usage would be solved by 1980, and from that period on coal would be environmentally acceptable. The various research and development projects now underway show promise of achieving that goal.

**40220** **APTIC NO. 63014**

Forney, A. K.

ENGINE EXHAUST EMISSIONS SUBPROGRAM. *Dept. of Transportation, Cambridge, Mass., Transporation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST- 73-4, p. 169-172. 2 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

The exhaust emissions from existing aircraft engines (the YG93-GE-3, the J85-GE-5, and the Rolls-Royce Olympus 593) will be measured. The substances of particular interest are water, hydroxyl, hydrogen peroxide, nitric oxide, nitrogen dioxide, nitrous oxide, nitrogen pentoxide, carbon dioxide, carbon monoxide, total hydrocarbons, formaldehyde, sulfur dioxide, nitrous acid, nitric acid, and particulates. On-line instruments, spectroscopy, and laboratory analysis are being used. Another project is a fuels analysis to determine the trace contaminants in aviation kerosene. The Engine Exhaust Emissions Subprogram will result in a projection of the amounts and types of effluents which will be deposited in the stratosphere by the high-altitude aircraft fleet projected for 1990.

**40221** **APTIC NO. 64487**

Furukawa, Toru, Daiji Koike, and Hisakazu Fukui

COMPOSITION OF EXHAUST GASES FROM 4-CYCLE GASOLINE ENGINES WHEN IDLING AND SLOWING DOWN. PART 1. THE EFFECTS OF OPERATION CONDITIONS ON THE CARBON MONOXIDE CONCENTRATION. *(4- saikuru gasorin kikan no aidoringu-ji oyobi gensokuji no haiki gasu sosei ni tsuite. Dai-1-po. CO nodo ni oyobosu unten joken no eikyo). Text in Japanese. Sasebo Kogyo Koto Senmon Gakko Kenkyu Hokoku (Rep. Sasebo Tech. Coll.), no. 9:1-4, Oct. 1972. 7 refs.*

Three harmful components in internal combustion engine exhaust gas are carbon monoxide, hydrocarbons and nitrogen oxides. The CO is produced mostly at idling, HC at deceleration, and NOx at acceleration. The effect of ignition time, rotational frequency, and adjusting screw opening on the CO concentration at idling and deceleration was investigated. The CO concentration decreases with increases, in rotational frequency as the result of the increased air-fuel ratio and the consequential increase in combustion efficiency. Delay in ignition time tended to result in a decrease in CO concentration. In the case of deceleration, the CO concentration decreased with the increase in deceleration rotational frequency, which was attributable to the dilution of CO concentration by the increased amount of unburned HC due to the increase in misfiring rate. Reduction mechanisms for CO concentration are proposed.

**40222** **APTIC NO. 63017**

Hurn, R. W., J. W. Vogh, F. W. Cox, and D. E. Seizinger

TRACE COMPONENTS OF AVIATION TURBINE FUELS AND EXHAUSTS. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 194-198. 11 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

The amounts of non-hydrocarbon materials that may be present in aviation turbine fuels and the degree and manner in which trace components of the fuel can be associated with turbine emissions are discussed. Progress made to date in analyzing exhaust gas samples obtained from a YJ-93-GE-3 engine operating in an altitude cell is reported. Aviation turbine fuel samples were made at four international airports, New York Kennedy, Los Angeles International, London Heathrow, and Frankfurt International airports. A sample was drawn from the aircraft fueling hose during the course of a routine fueling operation. Trace metals and other analytical data are available for the fuel samples from New York and Los Angeles. The New York samples consistently contain significantly greater quantities of copper and lead than were found in the Los Angeles samples. The differences in Pb content are particularly striking, as is the high iron content of one New York sample. (Author abstract modified)

**40223** **APTIC NO. 63019**

McGregor, W. K., B. L. Seiber, and J. D. Few

CONCENTRATION OF OH AND NO IN YG93-GE-3 ENGINE EXHAUSTS MEASURED IN SITU BY NARROW-LINE UV ABSORPTION. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 214-229. 18 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

The use of in situ techniques for measurement of the density of nitric oxide and hydroxyl was demonstrated in the measurement of the YJ93-GE-3 jet engine exhaust. Concentrations of other minor species in the combustion gases such as nitric oxide, hydrocarbons, sulfur oxides, and cyanide were obtained using the same technique. Methods were developed to determiine concentration profiles of water and carbon dioxide using measured infrared emission absorption and band model parameters. This inerative technique may also provide the best method of obtaining static temperature profiles. The emission absorption method may also be applied to CO in the infrared, although this has not been done yet. Progress was recently made in the detection of nitrogen dioxide by the absorption of continuum emission in the 2400-2600 A range. The only species which do not lend themselves to measurement by spectral techniques are the unburned hydrocarbons and the particulates.

**40224** **APTIC NO. 63016**

Neely, James and Donald L. Davidson

EMISSION LEVEL OF THE YF93-GE-3 ENGINE, AN SST-LIKE ENGINE. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 180-193. 8 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

Exhaust emissions of a YJ93-GE-3 afterburning turbojet engine were determined in a J-2 altitude test cell. The flight conditions at which data were taken varied from sea level static to 65,000 ft simulated altitude at Mach 2.7 and 75,000 ft at Mach 2.0, and included both afterburning and non-afterburning engine power settings. High quality carbon monoxide, carbon dioxide, CxHy, nitric oxide, and nitrogen oxides emission data were obtained at each test condition, together with a limited amount of nitrogen dioxide data at these test conditions. Data trends with test condition variables such as engine inlet air temperature and pressure are generally consistent with those predicted by combustion technology. The CO concentrations decreased with increasing combustor inlet pressure and temperature, while NO and NOx concentrations increased under the same conditions. The NO and NOx levels increased with increasing equivalence ratio, while both CO and CxHy decreased. At all afterburning conditions there was a central region of incomplete combustion at the exhaust plume characterized by high CO and CxHy levels. (Author abstract modified)

**40225** **APTIC NO. 64525**

Parker, Albert

ESTIMATES OF AIR POLLUTION IN THE UNITED KINGDOM IN THE YEAR 1970-71. *Clean Air, 1(6):18-20, Summer 1972.*

Estimates are given of the amount of energy and the amount of pollution by smoke and oxides of sulfur from the main uses of the primary forms of energy (coal, coke, oil, and energy production). Estimates are also given of amounts of carbon monoxide, hydrocarbons, aldehydes, oxides of nitrogen, and oxides of sulfur from gasoline and diesel engines in the U. K. The amount of lead discharged from gasoline vehicles is also estimated.

**40226** **APTIC NO. 62937**

Sowinski, E. J. and I. H. Suffet

A SYSTEMATIC METHOD FOR EVALUATING THE POTENTIAL ENVIRONMENTAL IMPACT OF NEW INDUSTRIAL CHEMICALS. *In: Pollution: Engineering and Scientific Solutions. Euval S. Barrekette (ed.), New York, Plenum, 1972 (?), p. 95-104. 21 refs.*

A general systematic approach to aid in the prediction of potential environmental impact of new industrial chemicals based on chemical fate guidelines was developed. The importance of chemical fate in predicting the potential impact of a new industrial chemical is depicted by a pollutant that exists as a unique manufacturing by-product and/or by a pollutant which undergoes chemical changes in the environment. It is necessary to develop selective and sensitive analytical methods for measuring by-products from laboratory modeling procedures or pilot processes. Specific studies demonstrated that analytical schemes can be developed for process by-products at the industrial air standards and manufacturing situations can be modeled for volatile boron containing compounds. This overall project, although patterned for the control of by-products from special metal hydride and organometallic chemicals, can provide a useful model for establishing preventative pollution control techniques in many industries. (Author summary modified)

**40227** **APTIC NO. 63015**

Williams, M. R.

EMISSION LEVELS OF THE OLYMPUS 593 ENGINE AT THE SUPERSONIC CRUISE CONDITIONS OF THE CONCORDE AIRCRAFT. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 173-179. (Nov. 14-17.) (Available from the National Technical Information Service.)*

Emission levels of an Olympus 593 Mk 602 jet engine were measured under simulated cruise conditions for the Concorde aircraft. The method used to predict emissions of carbon monoxide, unburned hydrocarbons, and oxides of nitrogen are briefly discussed. The error on the carbon dioxide test series was approximately twice that normally seen for sea level testing using the same technique, and was 10% on the fuel rich side of the calculated value. The emissions measured, in g/kg of fuel, were 17.8 to 19.3 for nitrogen dioxide, 1.4 to 4.6 for CO, and less than 0.8 for methane. (Author abstract modified)

**40228** **APTIC NO. 62982**

United Engineers and Constructors Inc., Philadelphia, Pa.

VOLUME III. COAL-FIRED FOSSIL PLANT. 1000-MWE CENTRAL STATION POWER PLANTS. INVESTMENT COST STUDY (FINAL REPORT). *Atomic Energy Commission Contract AT (30-1)-3032, 126p., June 1972. 1 ref.*

An investment cost study covering detailed cost and unit quantities is presented for a 1000 MWe nominally rated coal-fired fossil plant. The report is divided into the following sections: site and environment, technical description of plant, equipment list, list of drawings, and estimate of cost. The cost data are based on prices effective as of January 1971 and reflect to the maximum extent actual construction experience for units nearing completion or in operation. The data should be adjusted to reflect normal contingency costs for material, labor, and professional services. The cost estimates include the provision of two double compartment electrostatic precipitators for collecting suspended particulates.

## 1971

**40229** **APTIC NO. 64540**

Le Moan, G.

NUISANCES GENERATED BY THE DESTRUCTION OF PLASTIC FOOD PACKAGING MATERIALS. *(Nuisances entrainees par la destruction des emballages alimentaires en matieres plastiques). Text in French. Cah. Nutr. Diet., 6(3):55-58, 1971.*

The pyrolysis of different plastic materials that may occur as packaging materials in solid wastes was studied with and without oxygen under static and dynamic conditions at temperatures up to 550 C. The presence of carbon monoxide, carbon dioxide, hydrogen, saturated aliphatic hydrocarbons (such as methane, cyclic hydrocarbons such as benzene and toluene), and varying quantities of hydrocyanic acid from certain polyurethanes were found in the gaseous phase. Quasitotal of the chlorine present in PVC in the form of hydrochloric acid, a source of corrosion hazards, was determined. The condensates of PVC, polystyrene, polyethylene, and polypropylene contained such compounds as bistyrene, tristyrene, phenylethyne, triphenylene, acenaphthylene, fluorene, anthracene (polystyrene), benzofluoroanthene, benzoperylene rubicene, acenaphthylene, coronene, benzocoronene (polyethylene), diphenylmethane, pyrene, fluoranthene, benzopyrene, benzoperylene, and pentacene (polypropylene). Waste incinerators handling plastic wastes should be equipped with high-efficiency afterburners for the destruction of the hydrocarbons in general, and of carcinogenic substances in [illegible] lar. Also, a means for the retention of dust and HCl s[illegible] provided.

# CONTROL METHODS

## 1974

**40230** **APTIC NO. 64923**

Abe, Masazumi and Masami Fujiwara

DUST COLLECTOR DISCHARGE GATE AND GAS SEAL DEVICE. *(Jojinki haishutsu no dasuto oyobi gaso siru sochi). Text in Japanese. (Ishikawajima-Harima Heavy Industries (Japan)) Japan. Pat. Sho 49-20347. 5p., May 24, 1974. (Appl. Nov. 27, 1970, 1 claim).*

In the dust discharge gate of the dust collector for blast furnace, two sliding gate valves (one from each side) and damper are installed for flow rate control. The sliding gate valve is designed to slide in and out of the adjacent gate box for the opening and closing of the valve. At the closing position of the gate valve, the dust particles drift into the gate box from the slight gap between the valve and the box wall, slowly accumulating the dust in the gate box. Then the blast furnace has to be shut off for the cleaning of the gate box, since the dust collector is operating with 2.5 kg/sq cm inner pressure. To prevent such a dust flow into the gate box, an oval-shaped packing and O ring are installed in the sliding mechanism of the upper and lower sliding gate valves for complete sealing of the gate box. Also, ring packings are placed between the two brackets installed just above the lower gate valve and the lower gate valve, and the lower gate valve is pressed upward by a spring supported by two brackets installed just below the gate valve for the complete sealing of the lower gate valve. The damper located below the lower gate valve can be sealed completely at the close position by placing packing between the casing and the damper.

**40231** **APTIC NO. 63303**

Alter, Harvey and George W. Ingle

COATINGS WASTES AS ENERGY SOURCES. *Am. Paint Coatings J., 58(52):58-62, June 24, 1974. 15 refs.*

Total annual wastage of coatings for industrial and automotive applications amounts to approximately 1.25 times 10 to the 8th power kg of coatings solids. With an estimated fuel value of 1.5 times 10 to the 6th joules/kg (6500 Btu/lb), this quantity of waste has the energy equivalent of 17 times 10 to the 14th joules equivalent to approximately 4,700,000 gallons of fuel oil, assuming that all such wastes could be collected and converted to fuel energy. The heats of combustion of common organic polymers range from 17 to 46 times 10 to the 6th power joules/kg which compares well with coal as a fuel. The heat of combustion of lacquer is 17 to 21 times 10 to the 6th power joules/kg. The heats of combustion of some common polymers, the fuel properties of some automotive paint sludges, and some ash fusion temperatures are discussed. Although capture and use of the coatings waste would eliminate solid waste disposal and air pollution problems during coating operations, burning the coatings waste as a fuel might cause corrosion or air pollution during two cases: if a large part of the fuel consists of polymers containing a potential acid former such as chlorine; or if the fuel contains a concentration of heavy metal compounds. The ability to charge coatings waste into an existing boiler will depend on the design of the boiler and of the fuel materials handling equipment. A number of pyrolysis methods are described for disposing of the wastes and recovering energy. Pyrolysis would produce a fuel gas which could be substituted for natural gas. The cost of refuse pyrolysis has been estimated to be about $11 per input ton for a 250-ton/day plant including the cost of capital.

**40232** **APTIC NO. 64695**

Altwicker, Elmar R., Richard E. Gibbs, and Nicholas P. Kolak

CONTROL OF NITROGEN OXIDES FROM COMBUSTION PROCESS EFFLUENTS. *(Argo Research International, Ltd., New York) U. S. Pat. 3,784,478. 7p., Jan. 8, 1974. 9 refs. (Appl. Sept. 7, 1971, 6 claims).*

A process for the removal of nitrogen oxides from the effluents of combustion processes utilizing gas-liquid absorption is described. The liquid absorbent is a composition containing an electron donor compound, water, and an alkali compound, such as sodium hydroxide. These compositions have immensely improved absorption characteristics for the nitrogen oxides present in the effluent streams compared either to the water-electron donor system or the water-alkali system of other processes. A synergistic effect is produced for the absorption of nitrogen oxide pollutants present in stack gases.

**40233** **APTIC NO. 64883**

Altwicker, Elmar R and Tim Sekulic

INHIBITION OF SULFUR DIOXIDE OXIDATION DURING ABSORPTION. *Environ. Letters, 7(2):125-134, 1974. 9 refs.*

Sulfur dioxide in the stack gas from power stations and other fossil fuel-burning installations can be removed by absorption with chemical reaction in a solution of a salt reactive with SO2 or by absorption during scrubbing in an aqueous slurry. However, the presence of oxygen and trace metals can lead to the oxidation of SO2 and the formation of sulfate which can build-up and hinder absorption liquor recirculation unless it is removed and which can hinder sulfur recovery because sulfur as a sulfate is more difficult to regenerate than the reduced form. Processes are therefore needed to minimize the formation of sulfate in absorption liquors by the exclusion of oxygen and catalysts or by the use of suitable inhibitors. The inhibition of the cobalt (++)-catalyzed oxidation of sulfite solution was studied under controlled conditions by introducing a continuous flow of SO2/oxygen/nitrogen into a stirred buffer solution which contained catalyst and inhibitor. The uncatalyzed, uninhibited oxidation rate was somewhat erratic. The catalyst cobalt chloride increased the rate of sulfate formation and shortened or completely eliminated the induction period at a concentration above 0.0000848 M. Further concentration increases produced no change in the oxidation rate. The effect of 0.0002352 moles of the following inhibitors on the oxidation rate in the presence of 0.000848 moles Co(++) was also studied: acetyl-p-aminophenol, hydroquinone, hydroquinone sulfonic acid, thiodipropionic acid, and a combination of equimolar amounts of hydroquinone and thiodipropionic acid. Little or no dissolved oxygen was present for catalyzed, unihibited runs and at low hydroquinone concentrations; above 0.000138 moles hydroquinone, the oxygen concentration rose above 1 mg/l, but never reached the value calculated from Henry s law (3.24 mg/l).

**40234** **APTIC NO. 64836**

Andersson, Kjell

COMPLEX RECOVERY AND FLUE GAS CLEANING. *(Samatervinning - rokgasrening). Text in Swedish. Svensk Papperstid. (Stockholm), no. 8:279-282, 1974.*

The complex problem of by-product recovery of chemicals in flue gas cleaning for sulfite and kraft pulping is discussed. Even though the bulk of sulfur is lost via the soda boiler in the form of sulfur dioxide, it is not practicable to reduce to the SO2 emission by corresponding regulation of the soda boiler because the increased sulfidity will ultimately result in increased SO2 emission. The use of flue gas scrubbers can in certain cases results in a reduction of the SO2 emission, while in other cases, such as when no external sulfur is fed into the system, it has practically no effect on SO2 release. The sodium sulfite obtained from sodium hydroxide used as scrubbing liquid should be utilized, e.g., via a so-called alkali bank to be formed by the different pulping plants.

**40235** **APTIC NO. 64478**

Annergren, G. and E. Horntvedt

NSCC OR SULFUR-FREE PULP METHODS FOR CORRUGATING MEDIUM? *Pulp Paper Int., 16(6):58-61, June 1974. 1 ref.*

The search for a high-yield pulping method without sulfur emissions spurred interest in non-sulfur on low-sulfur pulping techniques for producing corrugating medium. Conventional NSSC (Neutral Sulfite Semichemical), pulping, however, could provide a better overall economic balance between wood yield and pulp/corrugating medium properties. The NSSC major shortcoming was the lack of a modern, effective chemical recovery method. The SCA-Billerud recovery system, first used on bisulfite cooking, was successfully used on NSSC to provide an effective recovery method without air pollution. The process is based upon the pyrolysis of the concentrated spend NSSC liquor. By pyrolysis, the sodium salts in the liquor are converted into sodium carbonate and the sulfur compounds into hydrogen sulfide. At the same time, the organics of the liquor are converted into a combustible gas and carbon. After combustion of the pyrolysis gas, the heat of combustion is recovered as steam in the second boiler. The sodium carbonate is dissolved in water and separated by filtration from the remaining carbon. The pure sodium carbonate solution is used for the absorption of the sulfur dioxide in the flue gases from the second boiler. By absorption of SO2 and recovery of sulfur, hydrogen sulfide emission is reduced below measurable limits (1 ppm). Thus, the sulfur emission of an SCA-Billerud recovery unit is lower than that of a plant with sulfur-free cooking and the SCA-Billerud system, and the pulping advantages of the NSSC process make the chemical/heat recovery system very economical. (Author abstract modified)

**40236** **APTIC NO. 63169**

Anurov, S. A., N. V. Kel tsev, V. I. Smola, and N. S. Torocheshnikov

ADSORPTIVE REMOVAL OF SULFUR DIOXIDE FROM INDUSTRIAL WASTE GASES. *(Adsorptsionnaya ochistka otkhodyashshikh promyshlennykh gazov ot dvuokisi sery). Text in Russian. Khim. Prom. (Moscow), no. 3:199-201, 1974. 12 refs.*

A static and kinetic study of the adsorption of sulfur dioxide on semicoke particles obtained by pyrolysis and thermal oxidation of soft and hard coals at 350-600 C and 860 C, respectively, is described. The semicoke particles, 2 mm in diameter, were previously treated at 400 C in dry nitrogen stream for 2 hr. The SO2 concentration in the test gas was 1% by volume, and the partial pressure and the temperatures were in the respective ranges of 2-15 mm Hg and 20-150 C. An increase in temperature from 20 to 150 C resulted in 80% decrease in the static activity of the adsorbent. However, the reduction in activity was negligible in the 50-150 C range. The zone of mass exchange (adsorbent layer thickness) increased rapidly with increases in temperature and adsorbate concentration. The degree of utilization of the adsorbent mass was at least 90% at 350 cm layer thickness, 150 C, and a SO2 concentration of 0.2% by volume. A pilot plant adsorber for a rated capacity of 1000 cu m/hr has been built on the basis of the experimental data.

**40237** **APTIC NO. 64885**

Anurov, S. A., V. I. Smola, V. A. Zinkovskiy, L. G. Guseletov, N. V. Kel tsev, and N. S. Torocheshnikov

PILOT TEST WITH THE ADSORPTIVE REMOVAL OF SULFUR OXIDES FROM WASTE GASES IN SULFURIC ACID PRODUCTION. *(Polupromyshlennyye ispytaniya adsorptsionnogo metoda ochistki otkhodyashchikh gazov sernokislotnogo proizvodstva ot okislov sery). Text in Russian. Khim. Prom. (Moscow), no. 6:445-446, 1974. 8 refs.*

Pilot tests concerning the adsorptive removal of sulfur oxides from waste gases generated in sulfuric acid production are described. Activated carbon with a particle size of 1.5-3 mm was best for the high-efficient adsorption of low concentrations of sulfur dioxide and sulfur trioxide. The SO2 and SO3 concentrations in the waste gas were in the respective ranges of 0.1-0.2% and 0.001-0.003% by volume. During the adsorption process, SO2 was oxidized to SO3 by the air oxygen, and the SO3 formed sulfuric acid with water vapor. The adsorbent was regenerated either by blowing with inert gas at 400-450 C whereby concentrated SO2 was obtained, or by washing with water or diluted sulfuric acid whereby dilute sulfuric acid with concentrations of up to 20% was obtained.

**40238** **APTIC NO. 64654**

Aoi, Katashi

IMPROVEMENTS IN OR RELATING TO EXHAUST GAS CLEANING APPARATUS FOR AN INTERNAL COMBUSTION ENGINE. *(Assignee not given.) Brit. Pat. 1,354,045. 6p., May 22, 1974. (Appl. Feb. 4, 1972, 10 claims).*

An exhaust gas cleaning apparatus for an internal combustion engine is described. The gas is subjected to adiabatic expansion and its temperature is sufficiently lowered for moisture to condense. The moisture is separated from the gas, passes through a filter, enters a waste liquid reservoir which has a vent hole to the atmosphere, and is heated in the reservoir for evaporation. Since a portion of the waste liquid is evaporated to the atmosphere, this is an improvement over other systems which have only a waste liquid storage tank.

**40239** **APTIC NO. 64440**

Araki, Kunio, Shigeji Honda, and Satoshi Otani

SIMULTANEOUS ELIMINATION OF SULFUR DIOXIDE, AMMONIA, AND AMINES BY ACTIVATED CARBON. *(Kasseitan ni yoru aryusan gasu, ammonia amin no doji jokyo). Text in Japanese. Preprint, Japan Chemical Society Hokkaido Branch, 1974, p. 22. (Presented at the Japan Chemical Society Hokkaido Branch, Summer Meeting, Kitami, Japan, July 25-26, 1974, Paper B04.)*

Some basic tests were conducted for the simultaneous treatment of sulfur dioxide and bad odor gas ammonia amine by activated carbon. By washing activated carbon, ammonia amine sulfate is recovered. The adsorption mechanism was studied by mixing diluted SO2 with ammonia amine and 10 vol% water with a microfeeder. The mixed gas was passed through an adsorption tube of 4 mm diameter, packed with 3-4 g of carbon at 100 C. The relationship between adsorption time and quantity was examined. The physical adsorption of SO2 was extremely small. By this adsorption oxidation, sulfur trioxide is created, which by hydration becomes sulfuric acid. Further hydrated H2SO4 is adsorbed by carbon. The adsorption quantity and time increased proportionately. The amount and concentration of H2SO4 accumulated on the carbon varied depending on the amount of added water. The total adsorption and ammonia adsorption increased in proportion to time, and ammonia was adsorbed in the form of ammonia sulfate.

**40240** **APTIC NO. 63252**

Araki, Yoshiki and Katsumi Kasano

BUILDING CONTROL LAW AND DUST COLLECTORS. *(Biru kanriho to shujin sochi). Text in Japanese. Mitsubishi Denki Giho (Tokyo), 48(470-477, April 1974. 7 refs.*

The Japanese law codes pertaining to building management and environmental health specify that the environmental standard for dusts be less than 0.15 mg/cu m of air, carbon monoxide concentration be less than 10 ppm, carbon dioxide concentration be less than 1000 ppm, temperature be between 17 and 28 C, and that when cooling the air, the difference between the room temperature and out of doors should not be too extreme. The relative humidity should be between 40 and 70%, and the air movement 0.5 m/sec or less. Various types of dust collectors, especially air filter dust collector and electrostatic precipitators are reviewed. The principles, characteristics, and efficiency of the two-level type electrostatic precipitator and the filter dielectric precipitator are discussed and mathematically analyzed. When selecting a dust collector, the purpose, the building type, the cleanliness of the building, the rate of dust formation in the building, the outer environment conditions, the rate of air supply and ventilation, natural ventilations, the dust collection rate, air resistance, water consumption, installation location and method, maintenance and inspection methods, cost, and capacity must be examined. Methods for the calculation of air cleaning capacity, calculation data, mathematical equations and analyses are presented. Examples of electrostatic precipitators installed at the Mitsubishi building and the Yomiuri building are presented.

**40241** **APTIC NO. 64645**

Arnold, Orlan M. and Carlo A. Vancini

GAS CLEANING APPARATUS. *(Peabody Engineering Corp., New York) U. S. Pat. 3,788,045. 10p., Jan. 29, 1974. 9 refs. (Appl. Sept. 13, 1971, 12 claims).*

A gas cleaning apparatus with at least two stages is described. In the first stage the gas is passed through a liquid spray for removing particulate material. In the second stage any remaining particulate matter or droplets are removed. The stages involve combinations of slotted baffles with deflectors for stripping the gas and bonnet units with concentric passages for reversal of flow for removing particulate matter by centrifugal action and by impingement. The advantages of this apparatus include the ability to vary the number and arrangement of the parts to meet specific requirements; utilization of the kinetic energy of the liquid spray and the velocity of the gas flow for the stripping operation; and reduction of the pressure drop to a minimum. (Author abstract modified)

**40242** **APTIC NO. 64914**

Atsukawa, Masumi

REVIEW OF RECENT STACK GAS DESULFURIZATION PROCESSES. *(Saikin no haien datsuryu gijutsu no tenbo). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 6-11, 1974. (Presented at the Japan Chemical Society, Chiguku/Shikoku Branch, Hiroshima Lecture Meeting, Hiroshima, Japan, Jan. 26, 1974.)*

Stack gas desulfurization processes are reviewed with brief explanations on their basic process and users. The soda process, the ammonia process, the lime process, the magnesia process, the molten salt process, the metal oxide absorption process, the alkali salt scrubbing process, the Reinluft, the Lurgi, the Grillo, the EDF (Electricite de France), the SFGD (by Shell), the Bahco, and the Bischoff are mentioned. The reactivities of various manganese oxides with sulfur dioxide, the characteristics of various scrubbers, and the by-products of the stack gas desulfurization processes are tabulated. The supply-demand balance for the by-products is further indicated.

**40243** **APTIC NO. 64766**

Ball, Frank J.

METHOD FOR REMOVING SULFUR DIOXIDE FROM WASTE GASES AND RECOVERING A CONCENTRATED STREAM OF SULFUR DIOXIDE. *(Westvaco Corp., New York) U. S. Pat. 3,789,110. 7p., Jan. 29, 1974. 5 refs. (Appl. July 23, 1971, 10 claims).*

A process is described for removing low concentrations of sulfur dioxide from a waste gas stream and recovering a stream of concentrated sulfur dioxide. Sulfur dioxide is adsorbed from a waste gas mixture onto an activated carbon as sulfuric acid, and a portion of the sulfuric acid, is reacted with hydrogen sulfide at a temperature below 350 F after which the temperature is raised above 350 F to form a concentrated stream of sulfur dioxide without carbon burn-off. The invention provides a process for regenerating spent carbon by contacting the carbon with hydrogen sulfide to reduce a portion of the adsorbed sulfuric acid on the activated carbon to sulfur and raising the temperature to recover a concentrated stream of sulfur dioxide. The recovered sulfur dioxide may be used in a variety of ways: it may be reacted with methane to produce hydrogen sulfide, reacted with hydrogen sulfide as in a Claus unit to produce essential sulfur, or converted to sulfuric acid. (Author abstract modified)

**40244** **APTIC NO. 64953**

Barba, John J.

SMOKE CONTROL APPARATUS. *(Olesen, Larry Frank and Virginia Ann Olesen, Alhambra, Calif.) Brit. Pat. 1,349,123. 7p., March 27, 1974. (Appl. Sept. 1, 1972, 24 claims).*

This invention provides apparatus for burning combustible material in the exhaust gas (smoke) of a furnace, an incinerator, or the like for the discharge into the atmosphere of substantially completely combusted, nonpolluting gas. The apparatus comprises a tubular member defining a combustion chamber, an inlet thereto and an outlet therefrom for passing exhaust gas therefrom, a burner adjacent the inlet for heating gas therethrough, burner means adjacent to the inlet for heating the exhaust gas entering the chamber to its combustion temperature, an outer shell disposed about its member, sealed securely thereto and defining a jacket surrounding the member, and means for flowing a coolant through the jacket maintaining the temperature of the member sufficiently low to prevent damage thereto from the exhaust gas combustion temperature in the chamber.

**40245** **APTIC NO. 63116**

Barnes, Gerald J.

A COMPARISON OF PLATINUM AND BASE-METAL OXIDATION CATALYSTS. *General Motors Corp., Warren, Mich., Physical Chemistry Dept., GMR-1570, PCP-21, 27p., March 29, 1974. 11 refs. (Presented at the American Chemical Society Symposium, Los Angeles, Calif., April 3, 1974.)*

Differences in the activity of fresh, supported platinum and base metal oxidation catalysts were evaluated in vehicle tests. Four catalytic converters were installed on a vehicled equipped with exhaust manifold air injection, and were tested over the 1975 Federal Test Procedure. As the converter size was decreased, base metal conversions of hydrocarbons and carbon monoxide decreased monotonically. In contrast, the Pt catalysts maintained very high conversion of CO for all converter sizes tested. Hydrocarbon conversions were relatively constant for catalyst volumes down to 1300 cc which indicates that overall hydrocarbon conversions were limited by methane oxidation. The performance of the base metal catalyst was nearly equal to that of the Pt catalyst at the largest converted volume of 43 cc. The reserve activity of the Pt catalyst makes it more able to tolerate thermal and contaminant degradation. Overall emission control by the Pt catalyst was primarily determined by emissions during vehicle warm-up. Warm-up rates were higher for smaller catalyst volumes. (Author abstract modified)

**40246** **APTIC NO. 64661**

Blankenfeld, Dietmar

THE USE OF OZONE FOR AIR AND WATER PREPARATION. *(Ozon fuer die Aufbereitung von Wasser und Luft). Text in German. CZ-Chem. Tech., 3(5):A163-A165, May 1974.*

Modern ozone generators, and the possible uses of ozone in air and water purification are described. In connection with one- stage or multistage gas scrubbers, ozonization is suitable for the practically complete deodorization of gases and vent air in synthetic fiber manufacturing plants, soap-works, flaying plants, and zootechnical facilities.

**40247** **APTIC NO. 64585**

Boese, Harold Lloyd and Thomas Ruth Hendey, Jr.

ANTI-POLLUTION MOTORS. *(Assignee not given.) Brit. Pat. 1,352,630. 7p., May 8, 1974. (Appl. Nov. 11, 1971, 8 claims).*

An antipollution motor for propulsion of automotive vehicles is described which gives off only nitrogen gas as an exhaust. Liquid nitrogen is employed as fuel, the liquefied gas being evaporated to drive a gas motor. The gas motor drives an electric generator, or alternator, the electrical power output from which is used to energize an electric drive motor which generates the power for the antipollution motor. The motor is of variable speed so that it may be used for propulsion of automotive vehicles or for other uses requiring variable speed operation. The motor operation is automatic in character so that it may be operated much the same as internal combustion and diesel motors.

**40248** **APTIC NO. 64742**

Bohls, Victor C. and D. Douglas Graham

EMISSION CONTROL DEVICE FOR CARBURETOR-EQUIPPED INTERNAL-COMBUSTION ENGINES. *(Assignee not given.) U. S. Pat. 3,786,793. 9p., Jan. 22, 1974. 9 refs. (Appl. Feb. 7, 1972, 9 claims).*

This invention relates to devices for control of polluting emissions from internal combustion engines, in particular carburetted engines operating on gasoline fuels in which a proportion of the exhaust products is recirculated to the intake manifold. Its improvement is the provision of a very simple device, incorporating control valves for the regulated emission of filtered air and exhaust gas to the intake system, which does not require modification of any part or accessory of the engine. In the device, an eccentrically pivoted control vane is provided in a bore interconnecting a standard carburetor with the intake manifold of the engine. The shaft of the control vane is connected to a pressure sensitive actuator exposed to the differential between atmospheric and induction manifold pressure levels; the angular position of the control vane is sensitive to both engine air mass flow and manifold vacuum. Two inlet ports, for diluting air and recirculating exhaust gas, variably obscured by tabs mounted on the control vane, flow through them depending on the angular position of the latter. A secondary air dilution circuit provides a small flow of air at intermediate manifold vacuum conditions. Pollution emission is substantially reduced by the admixture of recycled exhaust gas and of diluting air with the engine propellant charge.

**40249** **APTIC NO. 64656**

Bosco, Francis N.

AIR POLLUTION CONTROL METHOD. *(Assignee not given.) U. S. Pat. 3,784,099. 3p., Jan. 8, 1974. 2 refs. (Appl. Dec. 13, 1971, 12 claims).*

A novel seeding technique for reducing smog forming pollutants in the atmosphere is described. Latent heat is released from the condensation of water vapor into droplets which congeal into ice crystals. They serve as nuclei for a chain reaction of heat releases which induces an updraft so as to pierce the inversion layer. At the same time the chemicals used inhibit or prevent the formation of secondary or oxidant pollution products. In the past, the approach for seeding clouds for producing rain was to place excessive amounts of nuclei in the atmosphere to induce rainfall. In this method only very minute aggregates of nuclei and specifically colloidal approximately sub-micromolecular sizes are dispersed in a volume of atmosphere in such a way that nucleations take place free from adjacent nucleations. (Author summary modified)

**40250** **APTIC NO. 64832**

Brande, E. van den

CATALYTIC REDUCTION OF RESIDUAL GASES IN NITRIC ACID PRODUCTION. *(Katalytische reduktie van restgassen van salpeterzuurinstallaties). Text in Dutch. Ingenieursblad, 43(10):318-321, 1974.*

A process for the catalytic reduction of residual nitrous gases in nitric acid production by means of a honeycomb platinum catalyst on a ceramic support is described. About half of the waste gas containing 0.22% nitrogen oxides and 2% oxygen is heated to 495 C, the lower temperature limit of the catalyst, by means of natural gas. In this first catalyst, carbon monoxide and hydrogen are obtained by means of natural gas, resulting in a reduction of the lower temperature limit of the second catalytic stage to 140 C. In the first stage, where nitrogen dioxide is converted to nitric oxide, the temperature reaches 730 C. This hot gas is cooled to 480 C by the admission of more waste gas at 70 C. Due to the presence of a sufficient quantity of natural gas and oxygen in the second stage, the temperature reaches 585 C. The purified gas, containing 196 ppm nitrogen oxides, is admitted through a stack via a gas turbine. The gas plume emitted is colorless.

**40251** **APTIC NO. 63161**

Burgess, T. L., D. N. Carter, and D. E. McEachern

INCINERATION OF MALODOROUS GASES IN KRAFT PULP MILLS. *Pulp Paper Mag. Can., 75(5):92-96, May 1974. 3 refs. (Presented at the Canadian Pulp and Paper Association, Technical Section, Annual Meeting, 59th, Montreal, Quebec, Jan. 23-26, 1973.)*

The incineration of malodorous gases in kraft pulp mills is discussed. The actual incineration unit put at the end of the collection system will vary from mill to mill and several pieces of equipment have been used. The most common is the use of the lime kiln. Its main advantages are recovery of heating values of the gases, low capital cost, and recovery of sulfur dioxide. Alternative methods are used in various places. The most common practice in Scandinavia is the use of the bark burning power boiler, but unless the boiler is equipped with a wet scrubber, SO2 will be released to the atmosphere. The most common alternative in North America is that of a separate incinerator. The particular system and equipment best suited to any given mill should be determined by measurement of the sources and thorough evaluation of the alternatives. This will ensure a system tailor made to mill requirement and capable of meeting the environmental control standards set. (Author conclusions modified)

**40252** **APTIC NO. 64804**

Cantwell, E. N., Jr.

EXHAUST CONTROLS USE ENERGY. *Hydrocarbon Process, 57(7):94-103, July 1974. 26 refs.*

The effects of emission control devices on automobile fuel economy is discussed. Fuel economy of U. S. production vehicles decreased by 14% from 1967 to 1974 due to the imposition of exhaust emission controls and reduction of compression ratios. Emission standards approximating the 1975 interim standards are more than adequate to meet desirable air quality as prescribed by the Environmental Protection Agency in response to the Clean Air Act Amendments of 1970. The optimum system to achieve these standards is the noncatalytic thermal system. Being insensitive to leaded gasoline using this system would permit an increase in compression ratio, the single most important factor available to improve fuel economy. This system would obviate the need for unleaded gasoline which in turn would increase the yield of refined gasoline from a given crude oil supply.

**40253** **APTIC NO. 63362**

Carl, Daniel E.

INFLUENCE OF AMBIENT HUMIDITY ON NITRIC OXIDE GENERATION. *Gas Turbine Int., 15(3):28-32, May-June 1974. 3 refs.*

The effect of humidity on nitrogen oxide from gas turbines becomes important as combustion systems approach regulation limits. Water injection can reduce nitric oxide emissions by lowering flame temperature. This leads to the impression that other influences of humidity can be treated as perturbations of the thermal effect. A general expression was developed to relate the thermal properties affecting the adiabatic flame temperature of a combustion process involving water injection to those of combustion at various humidities so that emission data for water injection can be used to predict the nitric oxide emission level of a gas turbine at various humidities. The theoretical considerations are discussed. Experiments were conducted to verify the general theoretical expression. The results supported the prediction very well. The results also agreed well with the influence of humidity on diesel engines. Since increased humidity decreased NO formation, the theoretical expression could be applied to advance steam and water injection techniques for NOx reduction.

**40254** **APTIC NO. 63296**

Chapoux, Edouard

AIR POLLUTION CONTROL AND SAVING FUEL IN AUTOMOBILES. *(L action antipollution et l economie de carburant dans l automobile). Text in French. Pollut. Atmos (Paris), 16(61):7-10, Jan.-March 1974.*

The abatement of toxic emissions in automobile exhaust gases and its relationship with fuel saving are discussed. The exhaust emission control measures taken thus far in Europe have resulted in a decrease in fuel consumption and a reduction in carbon monoxide and hydrocarbon emissions. However, the impact of the individual driving habits, especially regarding acceleration, on the fuel saving is more pronounced than that of the reduction of the speed limits and of the use of exhaust control devices in late- model cars. Smooth driving (especially smooth acceleration), thrifty use of electric auxiliaries in the car, and proper idle adjustment will result in considerable improvement of the gas mileage.

**40255** **APTIC NO. 64452**

Cheremisinoff, P. N. and N. P. Cheremisinoff

CYCLONE DUST COLLECTORS. *Plant Eng., 28(14):69-71, July 11, 1974.*

The fundamentals and characteristics of cylcone dust collectors are discussed. Chief advantages include high collection efficiency, adaptability, and economy in power. The main disadvantage is that they are limited to the collection of large particles. Cyclones are not usually suitable for handling dusts containing large amounts of particulates measuring less than 10 micron in diameter. Cyclones can be operated up to 2000 F, can handle 10-2000 micron particles, and can have inlet dust loadings of from less than 1 to greater than 100 grains/cu ft/min. The theory of operation, collection efficiency, and pressure drop of cyclones are reviewed. Efficiency decreases as temperature increases due to gas viscosity changes, increases with velocity and falls off sharply below 25 ft/sec, increases with higher specific gravity materials, and increases with inlet loading. The theoretical efficiency curve shows that the cyclone has 0% efficiency for all particles smaller than the cut size and 100% for all larger sizes. Under actual operating conditions, however, a considerable amount of particulates smaller than the cut size is separated with the coarser particles because of particle aggregation. Efficiency also depends on pressure size drop according to the relationship: cyclone pressure drop equals a pressure drop constant times the gas density times the square of the entering gas velocity.

**40256** **APTIC NO. 64632**

Cho, Ping

A SLUDGE CAKE INCINERATION PROCESS AND AIR POLLUTION CONTROL SYSTEM. *Water Sewage Works, 1974:R76-R80, April 30, 1974. 4 refs. (Presented at the WWEMA First Industrial Water and Pollution Conference and Exposition, Chicago, Ill., March 1973.)*

The case history of a wastewater pollution control and sewage treatment plant is described. The facility was designed to provide for a minimum BOD removal of 90%. Raw primary, secondary, and digested sludges, or any combination thereof, are heated with air to reaction temperature and pressure and fed continously to the Zimpro wet oxidation units. This achieves 30-50% reduction of insoluble volatile solids. The dewatered sludge cake is transported to three multiple-hearth furnaces for incineration. These incinerators should have a total capacity of 570 tons/24 hr of sludge filter cake. Residue is hauled away for final land disposal. The thermal and mass balances of the entire incineration process and air pollution control system design were developed by means of a digital computer simulation program written in Fortran IV. The Sludge Incineration Process Heat Balance program is described. Typical inputs are ultimate and proximate analyses of sludge cake, ultimate analyses of auxiliary fuel and high heating value of auxiliary fuel, and operating temperatures at various points of incineration. Typical outputs are auxiliary fuel requriement, process water requirement for precooler and high-energy venturi wet scrubber, and mass volumetric flow rates of major constituents of combustion products wuch as carbon dioxide, nitrogen oxide, sulfur dioxide, and water vapor. A printout is given of input parameters used for one of the design cases under simulation study. A schematic flow design for the sludge incineration process, a flow chart of the computer program, and outputs of the simulation program are also presented. The control program consists of excess air combustion, an afterburner, waste heat recovery in a boiler, and a high energy venturi scrubber.

**40257** **APTIC NO. 64516**

Clegg, Bernard David

IMPROVEMENTS IN DUST EXTRACTION APPARATUS. *(Assignee not given.) Brit. Pat. 1,344,173. 6p., Jan. 16, 1974. (Appl. June 5, 1972, 12 claims).*

A dust extraction apparatus designed particularly for collection of wood dust is described which is much smaller, and hence less expensive, than prior art dust collectors used in the above application. The device includes a tangential discharge impeller arranged to discharge dust-laden air into two elongate ducts, one of the ducts having an inlet disposed to receive discharge from the periphery of the impeller, and the other duct having an inlet disposed to receive the discharge from nearer to the axis of rotation of the impeller and communicating with at lleast one filter element. Both ducts have a common duct outlet.

**40258** **APTIC NO. 63269**

Dayton, Stan

INSPIRATION S DESIGN FOR CLEAN AIR. *Eng. Mining J., 175(6):85-94, June 1974. 3 refs.*

Air pollution control and abatement at the Inspiration Consolidated Copper Company s new electric smelter and double absorption sulfuric acid plant are described. A control room houses the instruments which monitor and control furnace converter operating conditions. Temperature indicator and recorder panels track sensitive points in the system, including concentrate feed, hot gases, and cooling water. Functioning of equipment, which is operated either automatically or manually by local operators, is monitored in the smelter control room. A photometric analyzer monitors the sulfur dioxide content of effluent gases on seven locations. A paging system links the smelter control centers, the acid plant control center, and the smelter cranemen for telephone communications. Over 80% of the SO2 is converted to sulfur trioxide by a Lurgi plant equipped with four vanadium pentoxide catalyst beds. (Author conclusions modified)

**40259** **APTIC NO. 64508**

Deschamps, Andre, Claude Dezael, and Philippe Renault

PROCESS FOR PURIFYING A GAS CONTAINING OXYGEN AND SULFUR COMPOUNDS. *(Institut Francais Du Petrole, Des Carburants Et Lubrifiants, Rueil-Malmaison (France)) Brit. Pat. 1,351,583. 8p., May 1, 1974. (Appl. June 2, 1972, 11 claims).*

A method is described for removing sulfur dioxide from flue gas and producing elemental sulfur. The gas is contacted with a dilute aqueous solution of an alkali metal or ammonium neutral sulfite at 0-90 C, and the gas remaining is removed. The resultant solution is contacted continuously or batchwise with a weak anion exchanger to regenerate the dilute solution of alkali metal or ammonium sulfite and to increase the hydrogen sulfite ion content of the anion exchanger. The regenerated dilute neutral sulfite solution is recycled to the beginning of the process. The anion exchanger is regenerated by treatment with a concentrated aqueous solution of ammonia to enrich the ammonia solution in ammonium sulfite. The ammonium sulfite or thermal decomposition products are reacted with hydrogen sulfide to yield elemental sulfur, ammonia, and water. The ammonia and water are recycled back into the process.

**40260** **APTIC NO. 64650**

DeSeversky, Alexander P.

MULTI-CONCENTRIC WET ELECTROSTATIC PRECIPITATOR. *(Assignee not given.) U. S. Pat. 3,785,125. 8p., Jan. 15, 1974. 5 refs. (Appl. April 24, 1968, 1 claim).*

A multi-concentric wet electrostatic precipitator with a large operating capacity is described. The precipitator is formed by concentric annular channels all having the same radial dimension or air-gap, whereby the electrostatic voltage requirements for each channel are the same. The contaminants are carried away by a thin uniform film of liquid and the device can function simultaneously as a chemical reactor to create valuable compounds than can be extracted as by-products of air pollution control. This precipitator is superior to prior art models because the waste space is minimized making it of a compact size in relation to its operating capacity. It is self-cleaning and requires little maintenance. (Author abstract modified)

**40261** **APTIC NO. 64646**

Diehl, Charles Christian

APPARATUS FOR USE IN THE TREATMENT OF POLLUTED GASES. *(Assignee not given.) Brit. Pat. 1,349,805. 4p., April 10, 1974. (Appl. April 27, 1971, 5 claims).*

A baffle chamber for the decontamination and deodorization of sulfide-containing polluted gases is described. A contact is created between a chemical oxidizing agent and the gases. The oxidation reduction is completed quickly in a minimum of space to reduce the gaseous compounds to non-odorous compounds or those with an acceptable odor. The gases are treated with an atomized cloud or fine vaporized spray mist of the oxidizing chemical solution rather than passing them through a falling spray of the solution in the liquid form or through a bath.

**40262** **APTIC NO. 64467**

Dortenzo, Alexander T.

STEEL CONVERTER VESSEL POLLUTION CONTROL METHODS AND APPARATUS. *(Pennsylvania Engineering Corp., Pittsburgh, Pa.) U. S. Pat. 3,788,619. 6p., Jan. 29, 1974. 9 refs. (Appl. Feb. 23, 1972, 2 claims).*

A gas cleaning system is provided with electrostatic precipitators that can be utilized in either new plants or remodeled existing open hearth plants by using bottom blown converter vessels in association with a gas handling system that allows the delivery of dirty gas from the converter vessel to the precipitator at temperatures which are tolerable to the latter. It is an arrangement wherein there are one or more bottom blown steel converter vessels in a building. Each vessel has a water-cooled hood removably located over its mouth and a water-cooled duct connects to the hood. As near as possible to the vessel, and in a position where no interference is presented to the cranes and other apparatus for charging the vessel and handling its open contents, a water spray chamber is installed. The water-cooled duct from the hood has a short run to the spray chamber in which the gases evolved from the vessel are cooled from over 3000 to 550 F or 500 F. The relatively cool gases from each spray chamber associated with a converter vessel are delivered to an existing or new dirty gas main to which the inlet of an existing or new electrostatic precipitator is connected. The latter separates particulate matter such as smoke from the gases which are delivered by means of an exhaust fan to a stack. Carbon monoxide is precluded from igniting in the precipitator by burning it previously in the hood or above the melt surface in the vessel.

**40263** **APTIC NO. 64655**

Douthitt, Merton H.

APPARATUS FOR SORPTION OF GAS. *(SCM Corp., Cleveland, Ohio) U. S. Pat. 3,788,047. 5p., Jan. 29, 1974. 6 refs. (Appl. Nov. 4, 1971, 4 claims).*

An improved apparatus containing activated carbon for the sorption of impurities from vapor laden feed gas and a unitary fitting adapted for the apparatus are described. The improvement in the carbon sorber apparatus consists of a pair of check valves. The first valve permits unidirectional flow of laden feed gas from a supply line under superambient pressure into the inlet of a carbon sorber unit where the gases come into contact with the activated carbon. The second check valve supplies, in bypass of the carbon sorber unit and the first check valve, undirectional flow of ambient atmosphere into the supply line as subambient pressure. The unitary fitting houses both the check valves in proper interacting relationship for convenient, accurate, and compact installation of the apparatus. (Author abstract modified)

**40264** **APTIC NO. 63052**

Dulin, J. M., E. C. Rosar, H. S. Rosenberg, J. M. Genco, and R. B. Bennett

ADVANCES IN DISPOSAL OF SODIUM SALTS WASTES PRODUCED BY SOX EMISSIONS CONTROL PROCESSES, COOLING TOWERS, AND WATER DEMINERALIZERS. *Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 32p., 1974. 5 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 67th, Denver, Colo., June 11, 1974, Paper 74-60.)*

Two new techniques are presented for the removal of the highly soluble sodium salt products (sodium sulfite, bisulfite, and sulfate) of sulfur dioxide sorption processes such as stack gas desulfurization, cooling towers, and water demineralizers. Aqueous coprecipitation with acidic ferric ion is the basis for one technique, while sintering a pelletized mix with fly ash and/or bottom ash is the basis for the other. The techniques are not dependent on the type of sodium sorbent or the type of sulfur oxide emissions control apparatus or the process in which the sodium sorbents are used. Both methods permit renewed consideration of sodium alkali systems for SOx control without present problems of high waste solubility. (Author abstract modified)

**40265** **APTIC NO. 64793**

Dziewiecki, Zygmunt

DISSOCIATIVE ADSORTPION OF N2O ON REDUCED V2O5 SAMPLES. *Roczniki Chem., 48(4):655-661; 1974. 2 refs.*

Two series of vanadium pentoxide-x samples were prepared with the chemical compositions: V2O5 partially reduced with hydrogen, and a mixture of V2O5 and vanadium tetraoxide. Kinetics of the dissociative adsorption of nitrous oxide on samples of both series were studied. Partial reduction of V2O5 with hydrogen probably leads to V(+++) ion appearing in two various environments of the oxygen ligands: such as V2O4 lattice, if the value of the reduction degree is sufficiently high; similar to the V2O5 lattice, if during the reduction process only those oxygen ions are removed which are most weakly bound with the central vanadium ion. Dissociative adsorption of N2O, running on the surface of the V2O5 samples reduced with hydrogen, differs from that running on the surface of the samples which are a mechanical mixture of V2O5 and V2O4. These differences may be explained by assuming that the adsorptive properties of V(++++) ions depend on the distribution of oxygen ligands surrounding this ion. The bond strength of the surface oxygen in V2O5 samples, partially reduced with hydrogen, does not differ very much from the bond strength in pure V2O5. It results from little changes of adsorptive properties for reduced samples of V2O5 in relation to adsorptive properties of pure V2O5. (Author conclusions modified)

**40266** **APTIC NO. 63078**

Epstein, Michael, Louis Sybert, Shih-Chung Wang, and Charles C. Leivo

EPA ALKALI SCRUBBING TEST FACILITY: LIMESTONE WET SCRUBBING TEST RESULTS. *Bechtel Corp., San Francisco, Calif., Environmental Protection Agency Contract PH 22-68-67, Program Element 1AB013, Rept. ROAP 21ACY-32, EPA-650/2-74-010, 238p., Jan. 1974. 5 refs.*

NTIS: PB 232359/AS

Test results are reported for a prototype lime/limestone scrubbing test facility for removing sulfur dioxide and particulates from flue gases. The facility consists of three parallel scrubbers: a venturi/spray tower, a Turbulent Contact absorber, and a marble-bed scrubber. Each is able to treat a 10 Mw equivalent of flue gas from a coal-fired boiler at the Tennessee Valley Authority's Shawnee station. The report covers more than 1000 hrs of a long-term lime run on the TCA and more than 2000 hrs of a long-term run on the venturi/spray tower system. The objective of testing has been to identify the most economically attractive lime/limestone system operating conditions which are consistent with reasonable performance.

**40267** **APTIC NO. 64454**

Flood, B. W.

EMISSIONS FROM BAGASSE FIRED BOILERS. *Clean Air (J. Clean Air Soc. Australia New Zealand), 8(1):5-11, Feb. 1974. 1 ref.*

Most of the problems which arise in meeting the Australian Clean air Act requirements can be traced back to variations in the properties of the raw material input (sugar cane) to the sugar mill. The variations in the properties of the bagasse fuel and factory steam demand result in large fluctuation in the level of boiler emission (1.8-20.0 g/cu m) and the corresponding particle size distribution of the fly ash. To comply with Clean Air Act Regulations for 100% of the operating time, the miller may need to install high efficiency (greater than 98%) wet collectors with capital costs in the vicinity of $0.8-$0.9/cu ft/min of flue gas and operating costs as high as $0.18/cu ft/min. Work is continuing in an endeavor to lift the efficiency of the lower cost dry cyclone collectors above the present ceiling of about 92% on bagasse fly ash. However, it is not considered that the efficiency will be raised sufficiently in the near furture to cope with the extreme variations in the level of fly ash emission. Dry type cyclone collectors may be used on some boilers. However, one or more of the following conditions would generally neeed to apply: continuous cleaning of combustion chambers; lower boiler ratings; low level of extraneous matter in cane; minimum fluctuation in factory steam demand; and secondary air injection. A survey of the smoke density of sugar mill chimney emissions shows that the installation of high efficiency fly ash collectors and/or the injection of secondary air into the boiler generally reduces the density of the smoke emission to below Ringelmann No. 2. (Author conclusions)

**40268** **APTIC NO. 64854**

Flux, J. H.

THE CONTROL OF FUME FROM ELECTRIC ARC STEELMAKING. *Iron Steel Int., 47(3):185-192, June 1974. 2 refs.*

Methods for the control of fume from electric arc steelmaking are discussed. A maximum of 97% of the 20 lbs of fume generated in the electric arc funace for each ton of steel produced can be collected by a furnace system using electrostatic precipitators, venturi scrubbers, or gas filters as the final arrestment plant. The remainder of the fume escapes from the furnace structure, and new legislation requires that this emission be controlled. The fumes can contain very high proportion of carbon monoxide (90% concentrations) and/or hydrogen (65% concentrations) at various stages of the process. There are two stages in the conditioning: combustion of the gases and cooling and humidification. The detail design of these depend upon the type of extraction system and cleaner used. Melting shop ventilating systems using bag filters are suggested for dust removal. The gas filter maintains is efficiency for a wide range of gas throughputs both above and below the design figure provided the temperature does not exceed the limit imposed by the bag material and the gases are dry to prevent condensation resulting in clogging of the bag material. (Author abstract modified)

**40269** **APTIC NO. 64613**

Foster, Raymond C., Edgar G. Lowrance, and John P. Eames

REMOVAL OF ACIDIC GASES. *(Stone and Webster Corp., Boston, Mass.) Brit. Pat. 1,353,248. 12p., May 15, 1974. (Appl. April 19, 1971, 7 claims).*

A process is provided for substantially reducing the acidic gas content of a gaseous mixture with simultaneous regeneration of reagent materials which comprises: treating the gaseous mixture with an aqueous alkali metal hydroxide solution; reacting the resultant effluent liquid with aqueous sulfuric acid or an aqueous mixture containing sulfuric acid and the corresponding alkali metal sulfate in an amount sufficient to liberate the acidic gas or gases; removing the liberated acidic gas or gases by a stripping operation; and subjecting the resulting aqueous alkali metal sulfate solution to an electrolytic process whereby aqueous sulfuric acid or an aqueous mixture of the sulfuric acid and alkali metal sulfate is collected at the anode and is recycled for utilization in the reaction step and aqueous alkali metal hydroxide which forms at the cathode is recycled for use in the alkali metal hydroxide treatment step. No prior art method has been devised for substantially complete removal of hydrogen sulfide and/or carbon dioxide from a hydrocarbon gas whereby there is simultaneously obtained stripping of the gases and efficient and economic regeneration of reagent materials in condition suitable for recycling purposes. The process steps include absorption, adsorption, filtering, stripping, and electrolysis.

**40270** **APTIC NO. 63320**

Fukubayashi, H. H. and L. W. Higley

RECOVERY OF ZINC AND LEAD FROM BRASS SMELTER DUST. *Bureau of Mines, RI 7880, 10p., 1974. 5 refs.*

GPO

A pyrometallurgical process for the recovery of the zinc and lead contained in brass smelter flue dusts was developed. Tests on brass flue dust from several sources were made in a quartz tube, heated by an electric furnace to temperatures as high as 1050 C. The dusts were mixed with carbon and heated in an oxygen free atmosphere. Ninety-nine percent of the Zn and 12-25% of the Pb, both in the metallic state, could readily be removed from the dusts. Seventy-five percent of the Zn could be recovered, with less than 0.1% of the Pb, in the absence of chlorides. Pelletization techniques were investigated and 0.6 in. pellets were optimal. Pelletizing reduces the volume tenfold. (Author abstract modified)

**40271** **APTIC NO. 63138**

Furuhama, Shoichi and Yoshitaka Yoshida

COMBUSTION CHARACTERISTICS OF HYDROGEN ENGINE (REPORT NO. 3). *(Suiso enjin no nensho tokusei (dai3po)). Text in Japanese. Preprint, Automobile Technical Assoc., Tokyo, 1974, p. 173-178. (Presented at the Japan Automobile Technical Association, Lecture Meeting, Tokyo, Japan, May 1974, Paper 24.)*

A hydrogen air mixture close to the theoretical ratio sometimes causes abnormal combustion accompanied by sudden increase of nitrogen oxides. To prevent this condition in a hydrogen engine and to improve the combustion process, a suction throttle method, a hydrogen injection method, and a combination of premixture and injection were tried. With the suction throttle, NOx could be decreased greatly by making the air-hydrogen mixture ratio rich. This was achieved by fast combustion, less cycle fluctuation, higher gas temperature, and less nitrogen partial pressure. When premixture and injection were combined, the ratio, injection time, and ignition angle were all important factors, and optimum operating conditions were examined. A spark time of 30 BTDC and a premixture ratio 4.0 were the best. Spark or diesel ignition is difficult because the high temperature of H2 is lowered during injection. The NOx formation is very much affected by pressure rise dP/dT. If combustion speed can be slowed slightly, NOx will decrease even more.

**40272** **APTIC NO. 64709**

Fusamura, Nobuo, Takashi Iwasaki, and Hideaki Sekiguchi

DUST COLLECTION APPARATUS FOR MICROPARTICLE DUSTS-A TRIAL FOR THE COAGULATION METHOD OF DUST COLLECTION. *(Bisai funjin o hosokusuru shujin sochi--gyoshushiki jojinho no hitotsu no kokoromi). Text in Japanese. Kotsuzai Shigen (Frame Material), 5(20):20-25, 1974.*

A pilot plant of a dust collector with a pretreatment steam condensation device for dusts was designed. The model has a boiler for steam, a circulation pump, a cooler tank, a coagulator, a cleanser with two baffle boards, a cyclone, a suction pump, and an exhaust pipe. The boiler produces 1.5-4 cu m of steam at 105 C. The dusts and high temperature steam are mixed in the mixer and as the mixture is cooled by the water from the cooler tank, dusts form a larger particle around the core of condensed water. The two baffling boards can be adjusted to incline 60 degrees from the vertical position. The mixed air containing condensed particles jet-flow into the cleanser and collide into the baffle boards. Part of the condensed dusts drop into the recepticles below. The boards also prevent excess water drops from entering the cyclone. The collection rates were tested with 200 mesh pulverized rock powder varying steam supply, baffle boards, and changing the inclination of the boards. The best results were obtained when the boards were taken out but steam was supplied. The average collection rate was 72.5% with 90% rate for particles larger than 5 micron.

**40273** **APTIC NO. 64690**

Gano, Orville

ANTI-POLLUTION INTERNAL COMBUSTION ENGINE. *(Assignee not given.) U. S. Pat. 3,783,610. 18p., Jan. 8, 1974. 5 refs. (Appl. Feb. 8, 1972, 33 claims).*

An anti-pollution internal combustion and compressed air operated engine is described. The engine includes a group of firing cylinders and a group of compression cylinders. A storage reservoir is filled with compressed air during the engine firing and braking modes of operation. After stopping, the stored air motors the engine until it begins firing. The engine is provided with a pressurized fuel system which is regulated by the pressure in the storage reservoir. A selector valve is used to select the proper modes of operation for the compression cylinders: the braking mode for storing compressed air, the motoring mode for driving the engine on the compressed air stored during the braking mode, or the normal compression mode when the engine is firing. Other stored air engines utilize only one compression cylinder to compress the air for all the firing cylinders and require a manual adjustment of the piston position prior to restarting the engine. By using several compressor cylinders, one or more will be over top dead center when restarting is attempted. Since this engine was specifically designed for motor vehicles, it overcomes operational difficulties of prior engines in their inability to store sufficient air to be used in stop and go traffic. (Author abstract modified)

**40274** **APTIC NO. 64743**

Gardenier, Hugh Emory

PROCESS AND APPARATUS FOR CLEANSING AND PUMPING CONTAMINATED INDUSTRIAL GASES USING A NOZZLE HAVING A VARIABLE THROAT AREA. *(Aronetics, Inc., Tullahoma, Tenn.) U. S. Pat. 3,782,074. 11p., Jan. 1, 1974. 8 refs. (Appl. July 21, 1972, 31 claims).*

This invention provides an apparatus and process for efficiently removing contaminants from industrial gases in which the process variables are effectively controlled, there is no accompanying air pollution, and a high degree of system control is achieved, along with the utilization of a nozzle having a variable throat area. The removal of contaminants from a gas stream is accomplished by heating a liquid cleansing mechanism into the gas in vaporized and atomized form through a nozzle having a variable throat area, mixing the gas and the high energy cleansing medium thereby entrapping the contaminants, and separating clean gas from the cleansing medium containing the contaminants. The flow rate of the liquid cleansing medium is varied by changing the throat area of the nozzle to control one of the process variables such as the temperature of the liquid. The invention overcomes the disadvantage of the prior ejector nozzle which lacked the flexibility to meet changing processing conditions. (Author abstract modified)

**40275** **APTIC NO. 63227**

Gardner, B. R. and H. J. Lowe

THE RESEARCH AND DEVELOPMENT BACKGROUND TO THE ENVIRONMENTAL PROBLEMS ON NATURAL DRAUGHT COOLING TOWERS. *Atmos. Environ., 8(4):313-320, 437, April 1974. 14 refs. (Presented at the Symposium on Environmental Effects of Cooling Towers, Surrey, England, March 27-28, 1973, Paper 2.)*

The development of eliminators in the early 1950 s and their satisfactory performance in Central Electricity Generating Board cooling towers is traced. More recently, significant droplet carry-over (drift) has been detected at two new 2000 MW stations; relevant factors are that more spray is created in the bigger installations and that longer residence time in the larger towers increases droplet growth. However, the two recent occurrences were principally due to the use of eliminators which differed from the originally recommended designs in construction in one case, and in installation in the other. There is a prima facie case for adopting eliminators of a higher standard for future installations. It seems very possible that a closer pitched (1 3/4 in.) asbestos-cement louvre type would meet the need without penalizing the thermal performance of the tower. Blow-out and stripping of spray from the air inlets in high winds and at exposed sites remains a problem of conventional hyperbolic towers for which there is no complete solution. (Author abstract)

**40276** **APTIC NO. 64686**

Gardner, Conrad O.

FEEDBACK MODULATION OF EXHAUST GASES IN INTERNAL COMBUSTION ENGINES. *(Assignee not given.) U. S. Pat. 3,788,284. 6p., Jan. 29, 1974. 10 refs. (Appl. May 22, 1972, 18 claims).*

A system for modulation of the amplitude of engine exhaust feedback (recirculation) to the engine induction system during engine operation is described. The amplitude can be varied in a periodic manner at a frequency which is substantially constant or which may vary as a function of an engine operating parameter. The amplitude may vary as a step function betwen predetermined levels or continuously and may have a duty cycle which varies as a function of an engine operating parameter, e.g., exhaust manifold temperature. The modulation envelope is controlled by a modulator circuit controlling a valve position in the feedback path. The frequency of modulation is controlled by a divider or multiplier type circuit coupled between a pulse source, e.g., the distributor and the modulator circuit. Unlike other systems, the higher temperature of exhaust manifold operation is used to effectively convert carbon monoxide to carbon dioxide. The catalytic converter is arranged by direct coupling to the exhaust volume present in the exhaust manifold so it may also utilize increased exhaust temperatures for higher efficiency operation. (Author abstract modified)

**40277** **APTIC NO. 63120**

Gerhold, Clarence George

CARBURETOR CONTROL SYSTEM AND METHOD FOR REGULATING EXHAUST GAS COMPOSITION. *(Universal Oil Products Co., Des Plaines, Ill.) Brit. Pat. 1,344,521. 6p., Jan. 23, 1974. (Appl. May 24, 1971, 12 claims).*

A method and system for maintaining a desired exhaust gas composition in an internal combustion engine by varying the pressure in the carburetor float bowl are described. The air to fuel ratio or more particularly fuel input at the carburetor zone is controlled by adjusting the pressure on the fuel in the carburetor fuel float chamber responsive to changes in one or more variables: carbon monoxide content in the exhaust gas; oxygen content in the ambient air or in the exhaust gas; ambient air temperature; relative humidity of the ambient air; or a combination or more of the variables with barometric pressure. Various types of sensors and transmitters can be used. Compared to other systems, this method provides a relative simple approach to providing corrective variations in carburetion for an internal combustion engine. It is possible to permit optimum conversion of hydrocarbons, CO, and nitrogen oxides in a catalytic converter system.

**40278** **APTIC NO. 64859**

Goar, B. Gene

IMPURE FEEDS CAUSE CLAUS PLANT PROBLEMS. *Hydrocarbon Process., 53(7):129-132, July 1974. 17 refs. (Presented at the Gas Conditioning Conference, Annual, 24th, Norman, Okla., March 1974.)*

The effects of ammonia, carbon dioxide, hydrocarbons, and excessive water vapor on Claus plant operations are demonstrated by computer studies using a proprietary program. Burning excessive amounts of NH3 causes solids deposition and plugging, while unburned NH3 causes gradual deactivation. Excessive CO2 in the feed increases sulfur emissions to the atmosphere by 52%, but does not have as great an effect as excessive NH3 or hydrocarbons. Sulfur emissions are increased 63% by excessive hydrocarbons and 30% by excessive water vapor. Seven cases illustrate operation of a Claus process with a typical clean feed and feeds containing the various impurities.

**40279** **APTIC NO. 64428**

Graetz, Reinhard

FLUORIDE IN CERAMIC MATERIALS AND FUELS - PROVISION OF MATERIALS FOR THE PREVENTION OF FLUORIDE EMISSION. PART I. *(Fluor in keramischen Materialien und in Brennstoffen. Stoffliche Massnahmen zur Vermeidung von Fluor-Emissionen (Teil I)). Text in German. Ziegelind. (Wiesbaden), no. 4:164-168, 1974. 27 refs. BSTRACT*

The general problem of fluoride emissions, and the possibility of reduction of fluoride emissions in the stone and earth industry by the use of clays and fuels with low fluorine contents, and by stabilizing fluorine during the burning process, are described. Flue gas scrubbing for fluorine removal is not practical in the stone and earth industry due to the prohibitively high costs involved. During the burning process, gaseous fluorine emission should be prevented. Clays contain 0.01-0.1 weight percent fluorine, of which less than 20% are emitted in the flue gases.

**40280** **APTIC NO. 64512**

Grantham, Leroy F., William A. McCollum, Jr., and Dennis C. Gehri

REMOVAL OF NITROGEN OXIDES AND OTHER IMPURITIES FROM GASEOUS MIXTURES. *(North American Rockwell Corp., El Segundo, Calif.) Brit. Pat. 1 349 887. 24p., April 10, 1974. (Appl. April 19, 1971, 34 claims).*

A process for the removal of nitrogen oxides and various other types of contaminants (lead compounds, halogen compounds, oxides and metal oxides, inorganic acids, sulfur compounds, and particulates) from both flue gases and automotive exhausts is described which overcomes problems of catalyst deterioration, engine performance deterioration, and high cost associated with prior art methods. The gaseous mixture to be purified is contacted with a metal mesh wetted with a molten salt mixture containing alkali metal carbonates as an active absorbent for the impurities. The molten salt mixture may additionally contain carbon for the removal of nitrogen oxides from the gas.

**40281** **APTIC NO. 63123**

Grayson, Herbert G. and Edwin Frank Miller

FUEL SUPPLY SYSTEM FOR REDUCED EXHAUST EMISSION. *(Mobil Oil Corp., New York) Brit. Pat. 1,346,702. 7p., Feb. 13, 1974. (Appl. Aug. 30, 1972, 10 claims).*

A fuel supply system for reducing unburned hydrocarbons and carbon monoxide in an automobile exhaust is described. The high emissions characteristic of cold starts are prevented without major departure from present principles of design for internal combustion engines. Low emissions on cold start may be attained by adaptation of systems proposed 50 yr ago. Automotive fuel induction systems were developed in which the more volatile components of a normal gasoline are separated and held for use as engine fuel during cold start and warm-up. When light ends only are employed as the fuel, charge mixtures can be prepared in the carburetor which have dew points approximating or below ambient temperatures. The charge is therefore homogeneous and can be fired in the cylinder without undue enrichment. The use of a relatively more volatile fuel during start up and warm up phases of engine operation provides for more complete combustion to thereby reduce engine emissions such as hydrocarbons and carbon monoxide. Reductions of engine emissions are obtained without necessitating a change in the volatility of fuels as currently marketed.

**40282** **APTIC NO. 63122**

Griffin, L. I.

EVALUATION OF EQUATIONS FOR DESIGNING AMMONIACAL SCRUBBERS TO REMOVE SULFUR OXIDES FROM WASTE GAS (FINAL REPORT). *Environmental Protection Agency, Research Triangle Park, N. C., Gas Cleaning and Metallurgical Processes Branch, Program Element 1AB013, Rept. ROAP 21ACX-60, EPA-650/2-74-035, 23p., Jan. 1974. 4 refs.*

The work of H. F. Johnstone in 1935 and B. A. Chertkov in the 1950 s related to laboratory vapor pressure-temperature measurements of sulfur dioxide, ammonia, and water above ammoniacal solutions is reviewed, and Johnstone s vapor pressure equations are recast so that they can be used more easily in designing and controlling ammonia scrubbing processes for removing sulfur oxides from waste gas. The two works reviewed are in general agreement, but their measurements lead to different conclusions in several instances. Resolutions are suggested for the differences noted. Design data for ammoniacal scrubbers must include detailed knowledge of solution properties, with ammonium sulfite and bisulfite being cited as far more soluble in water than other sulfites.

**40283** **APTIC NO. 64653**

Griffin, Lindsay Ira, Jr.

FLUE GAS DESULFURIZATION PROCESS. *(Esso Research and Engineering Co., Linden, N. J.) Brit. Pat. 1,349,196. 8p., March 27, 1974. (Appl. June 1, 1971, 5 claims).*

A wet process for the removal of sulfur dioxide from flue gases is described. The gas is contacted with an aqueous absorbent solution containing ammonia and/or ammonium cations in a SO2 absorber in which a small portion of the tetravalent sulfur is oxidized to the hexavalent state. The effluent solution is acidified with ammonium bisulfate to liberate SO2 and to form an aqueous fluid mixture containing ammonium sulfate and ammonium bisulfate. A major portion of the ammonium sulfate is decomposed into ammonium bisulfate and ammonia. A major portion of the ammonium bisulfate is returned for acidification of the effluent solution. A minor portion of the ammonium bisulfate is returned and decomposed into a gaseous product mixture of nitrogen, SO2, and water vapor. Because the hexavalent sulfur formed in the absorber is converted back to SO2, the buildup of sulfate in the system is prevented and the yield of SO2 is improved as compared to other wet processes.

**40284** **APTIC NO. 64946**

Grozev, G. T. and D. G. Ivanov

KINETICS OF THE WATER VAPOR CONVERSION OF CARBON MONOXIDE IN CATALYST FLUIDIZED BED IN MAGNETIC FIELD. *(Sur la cinetique de la conversion de l oxyde de carbone par la vapeur d eau dans une couche fluide du catalyseur a champ magnetique). Text in French. Dokl. Bolg. Akad. Nauk, 27(3):349-352, 1974. 9 refs.*

The catalytic conversion of carbon monoxide on ferrosoferric oxide particles in fluidized bed of 0.4-2 mm with saturated water vapor was studied at 400-500 C, a volume rate of 2310-18,600/hr and at an electromagnetic induction of 0.01 Wb/sq m. The rate of conversion was highest with 0.89 for the particle fraction of 0.75-2.00 mm. For the particle fraction of 0.4-0.75 mm, the apparent activation energy was nearly constant around 158 joule/mol. The magnetic field had no effect on the apparent activation energy, but it increased the rate of conversion by improving the hydrodynamic characteristics of the fluidized bed, and permitted the conversion of CO on a water vapor-saturated catalyst at high volume rates.

**40285** **APTIC NO. 63099**

Gumbleton, James J., Robert A. Bolton, and W. Walter Land

OPTIMIZING ENGINE PARAMETERS WITH EXHAUST GAS RECIRCULATION. *Preprint, Society of Automotive Engineers, Inc., New York, 11p., 1974. 7 refs. (Presented at the Automotive Society of Engineers, Automotive Engineering Congress, Detroit, Mich., Feb. 25-March 1, 1974, Paper 740104.)*

An engine dynamometer and vehicle study is described which defines the relationship between optimizing engine parameters with exhaust gas recirculation (EGR). Optimization of air-fuel ratio (A/F) and spark timing is required to achieve the best combination of nitrogen oxides, hydrocarbon, and carbon monoxide control, while minimizing the losses in fuel economy and drivability. Increasing the spark advance with increasing EGR rates minimize the losses in fuel economy and vehicle drivability while achieving significant reductions in NOx emissions. This approach is limited by a deterioration in hydrocarbon emission control. The loss in hydrocarbon control can be minimized by spark retard, but with a loss in fuel economy. The A/F must be tailored to maintain good combustion for hydrocarbon emission control without excessive richness and loss of CO emission control. (Author abstract modified)

**40286** **APTIC NO. 63197**

Haag, T.

AN OVERVIEW OF INDUSTRY CHOICES FOR ANTI-POLLUTION COATINGS. *Preprint, National Paint and Coatings Assoc., 17p., 1974. (Presented at the National Paint and Coatings Association, Washington Paint Technical Group, Annual Symposium, 14th, Washington, D. C., April 1974.)*

The need for methods to reduce solvent emissions from surface coating operations and possible methods are reviewed. An application solids are increased, solvents emitted to the air decrease. Increasing solids content in the coating from 20 to 80 wt% results in a 16-fold reduction in the need for solvent. Various coatings are reviewed with respect to their emission of pollution. Aqueous and high solids solvent-borne coatings will be used as anti-pollution coatings in the 1970s, while even lower polluting systems such as powder will be eventually used. The merits and demerits of various anti-pollution systems and their feasibility in various applications are reviewed. Classes and characteristics of aqueous systems are reviewed. The three major forms are emulsions, colloidal dispersions, and water soluble types. Industry must make choices now for anti-pollution coatings to meet future standards.

**40287** **APTIC NO. 62940**

Haas, L. A. and S. E. Khalafalla

FORMATION OF SURFACE SULFIDES ON IRON THROUGH REACTION WITH SULFUR. *Bureau of Mines, Twin Cities, Minn., Twin Cities Metallurgy Research Center, RI 7847, 24p., 1974. 32 refs. (Presented at the Joint C.S.Ch.E./A.I.Ch.E. Conference, Vancouver (British Columbia), Sept. 9-12, 1973.)*

New uses for sulfur are being explored because of a predicted abundant supply of low cost S due to air pollution restriction for sulfur oxides. It is predicted that only 50% of the Canadian S generated from sour petroleum fuels will be marketed, and the rest will have to be stockpiled. The domestic supply of by-product S is expected to increase as pollution control technology is developed and implemented at fossil fuel power plants and at metallurgical smelters treating sulfide ores. Conditions were determined to form an iron sulfide adherent coating with a metallic golden luster on steel upon anaerobic heat treatment with S in the temperature range of 105 to 500 C with reaction times up to 68 hr. Optimum conditions were in the range of 105 C for about 70 hr to 285 C for 1 hr. Small quantities of petroleum oil accelerated the sulfide growth rate. The sulfide coating decreased the corrosion rate of steel in a neutral aqueous medium by a factor of two. (Author abstract modified)

**40288** **APTIC NO. 64920**

Habu, Kunikata

A HUMIDITY CONTROL DEVICE FOR THE ELECTROSTATIC PRECIPITATOR. *(Denki shujinki no choshitsu sochi). Text in Japanese. (Hitachi Plant Construction Co. (Japan)) Japan. Pat. Sho 49-22739. 2p., June 11, 1974. (Appl. Dec. 10, 1970, 1 claim).*

The humidity control device of this invention for electrostatic precipitators is designed to eliminate the problems of nozzle clogging and rain drop phenomenon due to the intermittent spraying operation of the existing device. In the water spray system with a spray nozzle attached at the end of a water pipe connected to the pressured distributing pipe, a branch pipe with a check valve for supplying steam is connected to the water pipe between the spray nozzle and the solenoid valve. The vapor pressure in the steam pipe is maintained lower than the back pressure in the water pipe during the water spraying. When the water spraying is stopped and the back pressure in the water pipe is diminished, the check valve in the steam pipe is opened by the vapor pressure and the steam is injected through the nozzle, preventing clogging as well as the rain drop phenomenon which produces slurry in the precipitator. When the water spraying operation is stopped, the dust particles adhere to the electrode surface, which results in a marked decrease in collecting efficiency at the onset of precipitator operation. By the device of this invention, the dust collecting operation can be continued with high efficiency without the time consuming labor of cleaning nozzles and removing slurry.

**40289** **APTIC NO. 63251**

Hara, Katsuro

SHINKO KINZOKU KOGYOSHO CO. LTD., FUCHU WORKS---AIMING AT IMPROVEMENT OF ENVIRONMENT. *(Kabu-Shinko Kinzoku Kogyosho Fuchu Kojo---Kankyo no kaizen o mezashite). Text in Japanese. Imono (Foundry), 46(5):56-59, May 1974.*

The pollution control measures taken at a foundry manufacturing hydraulic pumps and turbines are described. Seventy percent of the materials used are copper alloys. The layout of the foundry is shown by a schematic diagram. The noise from dust collectors was controlled by placing all dust collectors in a building-like enclosure lined with sound absorbers. The fumes from aqua regia used for acid washing are treated by washing and absorption, and the water used for the washing is neutralized before disposal. All furnaces were switched to low frequency furnaces in 1967 as a part of pollution control measures. The sand, dust, and noise from the shake-out machine was controlled by the use of air curtains and cabinets lined with sound absorbers. A separate windowless building lined with a noise absorber was constructed for the finishing process, since no other feasible method was available. Furthermore, improvements were made in the working environment.

**40290** **APTIC NO. 64477**

Harrison, J. L.

IRON AND STEEL WORKS AIR POLLUTION CONTROL. *Steel Times (London), 1974:367-370, 372-374, 376-380, 383-384, 386, May 1974. 22 refs.*

British laws, regulations, and standards regarding air pollution control from air and steel works are reviewed. Direct annual costs of air pollution equal $1000 million/yr, and health and social costs equal $1900 million/yr. Estimated capital and working expenditures on pollution control for various industries from 1958 to 1968 were $360 million for capital costs, $12 million for research and development, $780 million for 10-year working costs, and $94 million for the latest year s working cost. Estimates of smoke, sulfur oxides, and vehicle pollution are reviewed. Various laws regulating iron and steel work registration, and automobile emissions are mentioned. Sources of pollution in iron and steel works which produce grit, dust, and fume are reviewed. Theories of fume formation in oxygen steelmaking and methods of fume collection and disposal are discussed. Typical comparative collecting efficiencies and recommended systems for various iron and steel industry processes are presented. Dust arising from sinter strands can be collected by cyclones or dry electrostatic precipitators. Fabric filters can be used to collect dust from mineral dressing and materials handling. Fumes from coke ovens can be controlled by hoods, cyclones, bag filters, electrostatic precipitators, and other collectors. Blast furnaces can produce particles and gases which can be collected by dust collectors combined with venturi scrubbers. Steelmaking processes and basic oxygen steelmaking plants are discussed with respect to emissions and collection. Fabric filters are popular for removal of fumes from electric arc furnaces. Dust from deseaming plants can be collected by wet electrostatic precipitators or venturi scrubbers.

**40291** **APTIC NO. 64881**

Hattori, Yoshitaka

A LIQUEFACTION RECOVERY METHOD AND DEVICE FOR SOLVENT GASES OF CHLORINATED HYDROCARBONS. *(Ensoka tanka suiso nado no yozai gasu no ekika kaishu hoho oyobi sochi). Text in Japanese. (Suzuki Industries (Japan)) Japan. Pat. Sho 49-23094. 13p., June 13, 1974. (Appl. Aug. 21, 1970, 2 claims).*

A liquefaction recovery method and device for solvent gas of chlorinated hydrocarbons such as trichloroethylene emitted from the cleansing process of metal surfaces are described. The solvent gas from the cleansing tank is mixed with a spray mist of water and injected into a cyclone dust collector. In the cyclone, the solvent gas is condensation liquefied by the vortex effect and collected on the cyclone wall and led into the separation tank where the liquid solvent and water are separated by the difference in specific gravity. A hood placed over the cleansing tank is connected to a duct with a fan located midway and a spray nozzle for water located near the inlet of the cyclone. The treated gas outlet pipe with wire mesh for the removal of water mist placed at the lower end is located at the upper part of the cyclone. The liquid outlet pipe leading to the separation tank is located at the bottom of the cyclone. The separation tank is divided into two compartments connected by the opening at the lower part. The top water layer separated by the difference in specific gravity is led out through a water outlet pipe located at the upper part of the separation tank to the water tank, which is connected to the spray nozzle at the inlet of cyclone for recirculation. The bottom solvent layer is transferred to the adjacent compartment through an opening in the partition and returned to a solvent tank. The toxic solvent gases are recovered efficiently.

**40292** **APTIC NO. 64741**

Hay, Leon

PROCESS FOR PURIFYING GAS MIXTURES CONTAINING PARTICULARLY CO AS IMPURITY. *(L Air Liquide, Society Anonyme pour l Getude et l Exploitation des Procedes, Georges Claude, Paris (France)) U. S. Pat. 3,789,106. 4p., Jan. 29, 1974. 6 refs. (Appl. June 16, 1971, 2 claims).*

This invention provides an improved adsorption process for purifying gas mixtures containing carbon monoxide as an impurity as well as an installation for carrying out this process and any adsorbent mass necessary. The partial pressure of the CO is brought down to below 3 mm Hg, in which this mixture is brought into contact with a purifying mass formed of mordenite charged with copper in the ionic or metallic form. The invention permits, with the aid of certain molecular sieves, the elimination of the CO contained in a gas mixture. This is achieved at lower cost than with prior art methods, without considerable investments or stoppages, without rapid degradation of the adsorption masses being used, without requiring preliminary treatment of these masses or particular precautions, and with complete elimination.

**40293** **APTIC NO. 64679**

Hayakawa, Kazuya

AIR CONDITIONING SYSTEMS, THEIR FUTURE PROBLEMS. *(Biru no reidanbo shisutemu no kongo to mondaiten). Text in Japanese. Sekiryu Gakkai shi (J. Japan Petroleum Inst.) (Tokyo), 17(4): 298-303, April 1974. 2 refs.*

Air pollution from power generators for building air conditioners can be avoided by fuel substitution or process modification. For example, the conversion of high or low sulfur heavy oil into heating oil, city gas, or electricity is possible. For newly constructed buildings, an appropriate heat source system must be defined by fully examining the scale of the building, the cost of facilities and operation, the production of pollution, safety, and load ratio. For air conditioning systems using heating oil and city gas, a boiler plus an absorptive refrigerator system, a direct-firing water heater, a boiler plus a gas engine-driven refrigerator system, a boiler plus a steam turbine-driven refrigerator system, or a boiler plus a gas turbine-driven refrigerator system have good features. A heat source system using electricity can utilize a motorized refrigerator plus an electric heating system, a motorized heat pump system, a motorized heat pump plus an electric heating system, a motorized heat pump plus an air heat source heat pump system, or a motorized heat pump plus heating oil system. The use of electric power as an energy source for heaters is generally disadvantageous, but recent rise of fuel prices may make it more attractive.

**40294** **APTIC NO. 63134**

Hayashi, Taro

DUST COLLECTION AIR CURTAIN AND HOOD. *(Shujinyo ea katen to fudo). Text in Japanese. Preprint, Japan Society of Chemical Engineers, Tokai Branch, Nagoya, p. 41-46, 1974. (Presented at the Japan Society of Chemical Engineers, Tokai Branch, Study Meeting on The Behavior of Microparticles and Dust Collection, 32nd, Nagoya, Japan, Jan. 25, 1974.)*

The purposes of air curtains and hoods in dust collection systems are to prevent irregular flows created by speed variations and changes of flow directions, to create smooth flows, to establish a flow speed distribution to attain a simultaneous reaching time, and to improve the performance of the dust collector by adjusting direction and velocity distribution. The aerodynamics of gas flows in the hood are analyzed mathematically. Equations, graphs, and diagrams are presented to show design criteria for air curtains and hoods, and the shape, size, height, and flow rate are discussed.

**40295** **APTIC NO. 64865**

Hayashi, Yoshimasa and Kazuhiro Nishimura

A NITROGEN OXIDES EMISSION CONTROL DEVICE. *(Chisso sankabutusu haishutsu yokusei sochi). Text in Japanese. (Nissan Corp. (Japan)) Japan. Pat. Sho 49-17966. 4p., May 7, 1974. (Appl. May 15, 1970, 1 claim).*

A nitrogen oxides emission control device for automobiles utilizing direct recirculation of exhaust gas into the combustion chamber by reopening the valve of the exhaust port is described. The NOx formation in combustion engines can be reduced by lowering the maximum combustion temperature, which can be achieved by recirculating the exhaust gas back into the combustion chamber so that a certain ratio of exhaust gas is contained in the fuel gas, thereby reducing the heat emission per unit quantity. In the exhaust mechanism of combustion engines, the exhaust valve is connected to a cam by a locker arm and push rod. With the rotation of the cam, which is synchronized with the engine revolution, the displacement due to the cam lobe is transmitted to the valve, thereby lifting the valve. In this invention, an extra lobe is added to the cam so that the valve may reopen during the air intake process, allowing the simultaneous intake of fuel gas and exhaust gas. In the case of a multi-cylinder engine, the exhaust gas from other cylinders is used for recirculation. In this device, two cams, one with one lobe for suburban driving where NOx emission is not a grave concern and which provides higher combustion efficiency and the other with two lobes for urban driving with reduced NOx emission, are combined and can be switched according to the driving conditions by means of an oil hydraulic mechanism.

**40296** **APTIC NO. 63332**

Hellmers, P.

DESIGN AND AUTOMATION OF OPERATION OF HEAT GENERATORS IN HEAT SUPPLY PLANTS. *(Auslegung und Detriebsautomation von Waermeerzeugungsanlagen in Heizwerken.) Text in German. Tech. Mitt., 67(5):186-190, May 1974. 2 refs.*

The design of heat producing plants will, in the future, be influenced by new uniform data concerning the condition of the produced heat (1.0 bar and 120 C), by more stringent rules concerning emission of air pollutants and by new approaches to a further automation of operation. The higher costs arising through the higher demands for reduction of emissions can be compensated for by greater automation of the operations, and proper design. The latter includes adequately large combustion chambers, particularly in the case of the combustion of heavy fuel oil. Flame flue, flame flue end temperature, smoke flue, combustion aggregate, waste gas temperature, and waste gas flue must be properly tuned to each other for trouble-free operation with low emissions. The design of stacks is very important. Stacks have a considerable influence on the emission, particularly on that of soot flakes. Like the boiler units, the stacks must be adequate for all load conditions. This can be achieved only with multi-flue stacks with a separate flue for each boiler. For avoidance of the emission of soot flakes a high waste gas temperature is required.

**40297** **APTIC NO. 64468**

Hirsch, Ernest G. and George L. Nelson

PROCESS FOR REMOVING ASH FROM PRECIPITATORS. *(New England Power Co., Westboro, Mass.) U. S. Pat. 3,788,469. 9p., Jan. 29, 1974. 4 refs. (Appl. July 13, 1972, 16 claims).*

This invention provides a process for the removal of ash from precipitators by circulating water through their bottoms at a rate sufficient to prevent fouling accumulation of ash in the bottoms, treating the water to remove ash at a rate sufficient to keep the ash concentration below that at which fouling of the bottoms and piping will occur and recirculating the treated water to the bottoms. Preferably, the recirculation is continuous, and the underflow from a hydrocyclone separation stage is subjected to secondary stage hydrocyclone separation from which the underflow may be subjected to tertiary stage solids separation, the overflow from one or both further separation stages being recirculated. (Author abstract modified)

**40298** **APTIC NO. 64789**

Hisada, Shoichi

COOLING METHOD FOR INTERNAL COMBUSTION ENGINES AND EXHAUST GAS RECOMBUSTION METHOD. *(Nainen kikan no reikyaku narabi ni haiki gasu sainensho hoho). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-19727. 3p., May 20, 1974. (Appl. July 30, 1969, 1 claim).*

The air compressed by the piston movement of internal combustion engines led around the engine cylinder for cooling, and the air heated by the heat exchange process is then led into the flow of exhaust gas for recombustion. The back side of the piston, i.e., the crankcase, is made into an air tight air compression chamber. The air drawn into the air compression chamber with the upward movement of piston is compressed by the downward movement of the piston. The compressed air is led into the cooling duct encasing the cylinder for the cooling of the cylinder and the simultaneous heating of the air (by heat exchange, which is subsequently mixed with the exhaust gas for recombustion. The quantity and pressure of the heated air led into the exhaust manifold is controlled by regulating the timing of the air inlet valve opening and check valve opening located at the outlet of the compressed air chamber leading to the cooling duct. Since the piston movement is utilized for the compression of air, no additional compressor equipment or fuel is required. Therefore, no extra weight is added to the vehicle, and it is very economical.

**40299** **APTIC NO. 64921**

Hisada, Soichi

THE COMPLETE COMBUSTION METHOD FOR INTERNAL COMBUSTION ENGINES. *(Nainen kikan no kanzen nenshohoho). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-22967. 3p., June 12, 1974. (Appl. Sept. 24, 1969, 1 claim).*

The vaporization of fuel in the carburetor is affected by many factors such as atmospheric pressure and temperature and operational conditions, and stabilization of vaporization condition is difficult. In the device of this invention, the air heated by the radiator is trapped behind the fan by enclosing the area and led into the carburetor system by two routes to facilitate the vaporization of fuel. The conduit from the radiator and fan enclosure is connected to a three-way valve through which one pipe is connected to the air inlet pipe of carburetor outside the throttle valve and the other to the outlet pipe of the carburetor. The valve is controlled by the negative pressure in the air inlet pipe. The amount of heated air supplied to the carburetor varies with the engine speed, automatically regulating the amount. It is also regulated by the negative pressure of the air inlet pipe so that the amount of heated air supplied is proportional to the amount of fuel gas mixture corresponding to the driving mode such as high speed driving or idling. By the use of this device, the vaporization of fuels such as gasoline, kerosene, heavy oil, and L.P.G. can be facilitated by the addition of heated air, increasing the combustion efficiency at no additional fuel cost, since the heated air is provided by the heat exchange with the radiator.

**40300** **APTIC NO. 64740**

Huang, A. Ben and Arnold L. Ducoffe

ELECTROSTATIC PRECIPITATING APPARATUS AND METHOD. *(Assignee not given.) U. S. Pat. 3,782,905. 13p., Jan. 1, 1974. 7 refs. (Appl. May 1, 1972, 26 claims).*

This invention provides an electrostatic precipitating apparatus and method which separates the particles from a gas stream without collecting the particles on the primary field producing grids within the stream path so that operation is continuous. The invention creates minimum back pressure in the stream to minimize the power required to force the gas stream through. Because the particles are not collected on the grids within the gas stream the electrical field generating power is maintained at a minimum. The apparatus includes a duct through which the gas stream is forced, charging means for charging the particulate matter from the gas stream, and separating means for separating the charged particulate matter from the gas stream. Converter means may be provided for converting gaseous pollutants into particulate pollutants for separation. In the prior models, the collecting efficiency of the grids was lessened due to the insulation formed by the collected particles requiring a greater grid potential to maintain operations.

**40301** **APTIC NO. 64835**

Hultman, Bengt and Sture Noreus

SODIUM AND SULFUR BALANCE IN A PINEWOOD SULFATE PULP PLANT WITH OXYGEN BLEACHING AND WASTE GAS CLEANING. *(Natrium- och svavelbalans i en barrvedssulfatmassafabrik med syrgasblekning och rokgasrening). Text in Swedish. Svensk Papperstid. Stockholm), 77(6):201-203, April 10, 1974.*

The sodium and sulfur balance in a pinewood kraft pulp plant with waste gas cleaning in Sweden is described. The white liquor oxidation and the use of oxidized white liquor for oxygen bleaching implies that there are no changes in the sodium and sulfur budgets of the chemical cycle due to the introduction of oxygen bleaching. Bleaching is done by means of chlorine dioxide in a continuous process. Sulfuric acid, sodium chlorate, sulfur dioxide are used as reducing agents, and sodium chloride is used initially. The chlorine dioxide obtained is absorbed in water. The required high sulfidity of about 40% implies relatively great losses of sulfur in the form of sulfur dioxide. These losses are reduced by the use of a scrubber which retains 85-90% of the sulfur emitted by the soda boiler. The scrubber, using sulfide-containing alkali solution generated in the pulping process, also retains particulate matter missed by the electrostatic precipitator.

**40302** **APTIC NO. 64735**

Ichihara, Shoichi, Hauruichi Hara, and Takashi Ohara

METHOD FOR THE PRODUCTION OF AN AUTOMOTIVE EXHAUST GAS CATALYST. *(Nippon Shokubai Kogyo Co., Ltd., Osaka (Japan)) U. S. Pat. 3,787,333. 8p., Jan. 22, 1974. 5 refs. (Appl. Nov. 16, 1971, 26 claims).*

A method is described for preparing a catalyst suitable for use in catalytic system for oxidation of air pollutants (carbon monoxide and hydrocarbons) in automobile exhaust gases. The method comprises, in combination, the steps of mixing and kneading a nickel source and a chromium source and, as a binder, a member selected from the group consisting of an alumina sol and a soluble aluminum hydroxide, and, as a carrier, activated alumina, molding the resultant mixture with a catalyst molder into a desired shape, drying the formed material, impregnating this material with a solution of palladium salt, drying the material, and then calcining. (Author abstract)

**40303** **APTIC NO. 64437**

Iinoya, Koichi

RECENT DUST COLLECTION TECHNIQUES AND THEIR PROBLEMS. *(Saikin no shujin gijutsu to sono mondaiten). Text in Japanese. Kemikaru Enjiniyaringu (Chem. Eng.), 19(6):9-12, June 1974.*

The dust collection devices recently used in Japan are almost exclusively bag filters and electrostatic precipitators, and the choice is determined largely by the balance between cost and performance. Various kinds of collectors are discussed with diagrams. Bag filters come in the vibration type, reverse air, and reverse pulse jet. This last is a surface filter and dust shaking is easy and the equipment is durable. In the future, a new filter material for a simplified, large-surface filter area structure must be developed. The weakness of filter bags is its weakness against high temperature and high humidity. Therefore, the filter material and the method fo cooling gas must be carefully selected. The present filter speed is 1 m/min and the dust load is less than 0.5 kg/sq m, and it requires a large area of filtering. But for the treatment of less than 2000 cu m/min, it is the most effective and practical method. The electrostatic precipitator is suitable for large quantity dust collection. Maintenance is relatively simple. Although the electric resistance of dusts is limited, it can be adjusted to a certain extent by humidifying dusts. The wet type precipitator presents no such problem, but the treatment of liquid waste is costly. The dry precipitator is inferior to the bag filter in performance. Among scrubbers the only type that can perform as well as bag filters and precipitators is the venturi type. The operation is expensive because of the pressure loss and liquid treatment. When excess pressure is available as in the case of steel blast furnaces, the scrubber is practical.

**40304** **APTIC NO. 64938**

Ikegaya, Hiroshi

HIGH TEMPERATURE RESISTANCE MEASURES FOR BAG FILTERS. *(Baggu firuta no koon taisaku). Text in Japanese. Kemikaru Enjiniyaringu (Chem. Eng.), 19(6):526-530, June 1974. 3 refs.*

Exhaust gas temperature, dust conditions, and particle size distribution vary with operating conditions for cupola furnaces. The dust formation is directly proportional to cokes ratio. Dust formation increases three times as the coke ratio increases from 9% to 15%. At a coke ratio of 11.4%, dusts collected from a heat exchanger of a hot air cupola furnace consist of 41.1% particles under 10 micron and 29.6% larger than 35 micron. The heat exchanger can reduce the exhaust temperature at the top of the furnace from about 850 C to about 600 C. Heat resistant materials are required for dampers at the top of the furnace and for the gas cooler. Glass cloth or teflon is usually used as the bag filter material in dust collection from high temperature cupola furnaces. In low and high frequency furnaces for copper stretching and iron casting exhaust gas has a temperature of 500 to 788 C at the top of the furnace, but is reduced to 150 to 250 C by a preduster and gas cooler before reaching to the bag filter. The dust mainly consists of copper oxides, tin oxides, and lead oxides. Heat resistant materials are required as well. Exhaust gas treatment of a thermal reaction furnace requires quick operation since the high temperature of exhaust gas is usually emitted spontaneously. A combination of a preduster and an improved bag filter material is successfully used to substitute the conventional wet process dust collection which had been employed due to the high moisture content of the dust.

**40305** **APTIC NO. 64866**

Imai, Hisashi

EXHAUST GAS CLEANSING DEVICE FOR INTERNAL COMBUSTION ENGINES. *(Nainen kikan no haiki gasu joka sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-18845. 3p., May 13, 1974. (Appl. April 25, 1969, 1 claim).*

A gas cleansing device based on catalytic oxidation, and used primarily for automotive exhaust gas is described. This device consists of a cylindrical separation chamber with partitioned front and back compartments, a cylindrical filtration chamber containing two wire net cylinders packed with catalyst in-between nets, and a conduit connecting these two chambers. The exhaust gas injected at an angle into the front compartment is converted into a vortex flow, thereby centrifugally separating dust particles into the side stream and sending the unsaturated gases with relatively small specific gravity as a main stream with air inducted into the back compartment to the catalytic cylinder for the oxidation reaction. The cleansed exhaust gas passed through the catalytic layer is joined with the side stream containing dust particles in the outer part of the chamber. The side stream is carried through several bypass tubes connecting between the separation chamber and the outer part of the filtration chamber. Since the gas containing dust particles bypasses the catalytic layer, the catalytic oxidation can be carried out more efficiently without deterioration of catalyst caused by dust particles and tar-like substances. The over-heating due to the temperature rise that accompanies the progress of the oxidation reaction can be avoided by heat exchange with the cooler side stream containing dust particles.

**40306** **APTIC NO. 64897**

Imai, Hisashi

EXHAUST GAS CLEANSING DEVICE FOR INTERNAL COMBUSTION ENGINES. *(Nainen kikan no haiki gasu joka sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-22969. 3p., June 12, 1974. (Appl. Dec. 10, 1969, 1 claim).*

A catalytic oxidation cleansing device for exhaust gas from internal combustion engine is described. A vortex chamber and separation chamber are housed in a cylindrical body and are connected by a conduit. A tangential exhaust gas inlet and an auxiliary air inlet parallel to the axis of the cylinder for supplementing air in the case of low exhaust gas flow rate are connected to the vortex chamber. An exhaust gas outlet and a conduit leading to the constricted part of the exhaust gas inlet pipe are connected to the separation chamber. The exhaust gas injected into the vortex chamber is mixed with catalyst and oxidized in the spiral flow, and then led into the separation chamber leaving most of the catalyst behind in the vortex chamber. A small amount of catalyst carried into the separation chamber completes the oxidation and is separated by the centrifugal force before emission through the treated exhaust gas outlet. The catalyst collected in the separation chamber is recirculated into the untreated exhaust gas through a conduit leading to the constricted part of the exhaust gas inlet pipe by venturi effect and returned to the vortex chamber. The catalysts are crushed into smaller particles by the effect of spiral flow and collision with the wall, constantly exposing fresh surface for efficient oxidation. The inactivated catalyst is vented to the atmosphere with the treated exhaust gas.

**40307** **APTIC NO. 64900**

Imai, Hisachi

PREVENTION OF BLACK SMOKE AND FLYASH EMISSION FROM INTERNAL COMBUSTION ENGINES. *(Nainen kikan yorino kokuen kafun hoshutsu boshi sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-22968. 3p., June 12, 1974. (Appl. Nov. 29, 1969, 1 claim).*

A device for preventing black smoke and flyash emission from large trailer truck and diesel engines is described. In a cylindrical body, three chambers are built by partitions. The vortex chamber is in the center with the separation chamber on the side and the collection chamber on the other side. A cylindrical conduit placed concentrically across the vortex chamber connects the separation chamber and collection chamber. These two chambers are also connected by another conduit placed on the outer side of the cylinder with a tangential opening into the collection chamber. A tangential exhaust gas inlet is connected to the vortex chamber. The spiral flow of exhaust gas is led into the separation chamber through radiating openings with induction plates and to the exhaust gas outlet after the separation of particulate matter. The particulates separated by centrifugal force are drawn into the collection chamber through the outer conduit by the pressure difference. The particulates are deposited in the collection chamber by the vortex flow in the chamber, and the gaseous components are returned to the separation chamber through the concentric conduit. The treated exhaust gas from the separation chamber may be passed through a silencer and/or catalytic filter before emission into the atmosphere. The particulates deposited in the collection chamber are removed periodically.

**40308** **APTIC NO. 64667**

Inaba, Hideya

DEVELOPMENT OF DENITRIFICATION PROCESS BY CATALYTIC REDUCTION FROM STACK GAS. *(NOx jokyoho (kangenho) no kaihatsu). Text in Japanese. Nikkakyo Geppo (Mon. Bull. Jap. Chem. Ind. Assoc.), 27(2):64-72, Feb. 1974.*

Dry contact catalytic reduction methods for removal of nitrogen oxides from exhaust gas mixtures containing NOx and sulfur oxides are described. Pilot plant flow sheets (diagrams) used by Hitachi Shipbuilding are included. Four types of catalyst were used: A, B, C, D. A and B are nonselective, and the reducing agents are carbon monoxide, hydrogen, and methane. Sulfur content must be below 10 ppm to prevent a decrease in activity. Catalyst B operates at a temperature about 50 C below that of A. Catalyst C is semi-selective, and behaves similarly to A and B, but is not poisoned at all by sulfur dioxide, and is not reduced. The selective catalyst, D, uses ammonia as the reducing agent, and is not poisoned by SO2. By using catalysts C or D, the denitrification process can precede the desulfurization process. The NOx concentration can be reduced to 10 ppm.

**40309** **APTIC NO. 64915**

Inoue, Kiyoshi

ELECTROSTATIC PRECIPITATOR. *(Denki shujin sochi). Text in Japanese. (Inoue Japax Co. (Japan)) Japan. Pat. Sho 48-22017. 3p., June 5, 1974. (Appl. June 4, 1969, 2 claims).*

An electrostatic precipitator consisting of a wire net or lattice shaped discharge electrode and a gutter shaped collecting electrode with liquid inlet and outlet is described. A gutter shaped collecting electrode is placed horizontally so that liquid such as water, ammonia water, dilute sulfuric acid, or aqueous glycerine solution can flow through the gutter at a given rate. The negatively charged dust particles attracted to the collecting electrode are adsorbed onto the liquid and carried out of the precipitator. The toxic gases such as ozone and nitrogen compounds produced by corona discharge are also carried toward the collecting electrode by a sort of electric wind and adsorbed onto the liquid and thereby removed. The discharge electrode is placed on a slant so that it covers the passageway of the exhaust gas. In a second invention, a supersonic vibrator is added to the above-mentioned electrostatic precipitator for the purpose of stirring up the flowing exhaust gas to increase the collision frequency of particles and collision frequency of dust particle and liquid, thus increasing the dust collecting efficiency. By applying 50 KV voltage, air containing 1800 ppm carbon monoxide was passed through at the flow rate of 2.2 l/sec, and the CO content was reduced to 0.04 ppm in the case of using no liquid, to 0.005 ppm in the case of passing water in the gutter shaped collecting electrode at the rate of 3 l/m, and to 0.003 ppm in the case of giving 18 Kc/s vibration to air using two supersonic vibrators.

**40310** **APTIC NO. 64788**

Ishizuya, Akira, Shuichi Yamasaki, and Junji Otani

A CONTROL DEVICE FOR THE RECOMBUSTION CHAMBER OF AN ENGINE. *(Enjin ni okeru sainensho sochi no sado seigyo sochi). Text in Japanese. (Honda Technical Research and Industry, Co., Ltd. (Japan)) Japan. Pat. Sho 49-19728. 4p., May 20, 1974. (Appl. Sept. 16, 1969, 1 claim).*

In automobile exhaust systems, a recombustion device is often installed for the complete combustion of the gas from the engine before emission into the atmosphere. In the high output driving range with wider throttle valve opening of carburetor, the fuel is combusted almost completely in the engine, and there is no need for recombustion in the exhaust system. In such a driving range, air injection for the operation of recombustion device is unnecessary. Morever, the supply of air at this time facilitates the oxidation of the interior of recombustion chamber, and thereby decreases the durability of the device. In this invention, a valve is placed in the conduit connecting the air pump and recombustion device, and the opening and closing of the valve is controlled by the throttle valve opening. At a certain opening position of the throttle valve, the air flow into the recombustion chamber is shut off by closing the valve in the air conduit, and after the closing of the valve the throttle valve is opened to full position. By this mechanism, the operation of a recombustion device can be stopped during the high output driving with higher combustion efficiency.

**40311** **APTIC NO. 63284**

Isoda, Toru

DEVELOPMENT OF STACK GAS DUST COLLECTOR. *(Baienyo shujin sochi no kaihatsu). Text in Japanese. Preprint, Osaka Prefectural Industrial Research Inst., p. 29-30, 1974. (Presented at the Osaka Prefectural Industrial Research Institute Study Meeting, Osaka, Japan, May 29, 1974, Paper I-15.)*

A simplification of the complex dust shaking mechanism on previously used dust collectors, using the energy of dust containing air current directly for shaking, is described. The apparatus is made smaller by creating a cyclone effect with the dust-containing air. Three types of bag filters were newly designed, and experiments were conducted using a small model. The first model creates an air flow pattern around a conical air filter bag, and the energy of the air flow is continuously applied to scatter the accumulated dusts. The second model is a conical bag with a porous inner frame, and the accumulated dust mounds are scattered by the centrifugal energy of the air current. The third model involves conversion of kinetic energy of air current into mechanical energy of a rotation vane on the top of the bag, which in turn shakes off the dust. The first model had a problem with the filter surface pressure. The second model had a 99.9% average dust collection efficiency at the filter speed of 5.4 cm/sec-8.4 cm/sec. with the selection of an appropriate filter fabric, the construction of a compact model with this filter bag will be possible.

**40312** **APTIC NO. 64786**

Ito, Mikiji, or in the Michihiro Ohashi, and Kiyohiko Mizuno

EXHAUST GAS CLEANSING SERVICE. *(Haiki gasu joka sochi). Text in Japanese. (Japan Electrification Co. (Japan)) Japan. Pat. Sho 49-18846. 4p., May 13, 1974. (Appl. July 8, 1969, 1 claim).*

In the exhaust gas cleansing device based on injecting air into the exhaust port, more than one igniter is placed in the exhaust manifold or in the vicinity of the manifold of the exhaust pipe. The temperature in the engine, and/or exhaust manifold, or the choke valve opening is contantly censored. During the period when the temperature is below a certain level or when the choke valve is not completely opened, the fuel or both fuel and air are injected into the manifold to increase the concentration of combustible components, thereby facilitating the combustion of exhaust gas. When the choke valve is closed, particularly in cold weather, complete oxidation is retarded in spite of the high combustible component concentration. The igniter is located after the secondary air and fuel injection nozzle and is operated with an electromagnetic pump which is controlled by signals from the temperature sensor. The exhaust gas from the exhaust port is mixed with air from the air injection nozzle located at the upper stream of the manifold and is ignited to flame by the igniter in the down stream of the manifold. By this process, the carbon monoxide and hydrocarbons in the exhaust gas are nearly completely oxidized.

**40313** **APTIC NO. 63232**

Jaeger, W., K. Schmidt, and H. Weichardt

A NEW METHOD FOR DECONTAMINATING PHENOL CONTAINING WASTE AIR FROM CASTING AFTER THE SHELL MOLDING PROCESS. *(Eine neue Methode zur Entgiftung phenolhaltiger Abluft beim Giessen nach dem Maskenformverfahren). Text in German. Zentr. Arbeitsmed. Arbeitsschutz, 24(6):177-180, 1974. 6 refs.*

During the casting of steel according to a procedure described by Croning, considerable amounts of phenol are set free. Aqueous permanganate oxidizes phenol to nontoxic reaction products. A new technical process based on this procedure is described. It achieves a level of detoxification of 94% and the concentration of phenol in the purified air is far below the maximum allowable working place concentration (MAK) value. The curve of phenol emission after casting is recorded by measurements at two-minute intervals.

**40314** **APTIC NO. 64590**

Jaulmes, Eric

TWO-STROKE ENGINE. *(Ateliers De La Motobecane, Pantin, France) Brit. Pat. 1,353,288. 8p., May 15, 1974. (Appl. Oct. 4, 1972, 12 claims).*

This invention relates to an improved two-stroke engine, with direct injection, realizing a practically complete combustion of the fuel-air mixture resulting in very little air pollution, and ensuring a very important reduction in consumption. Its lubrication is effected separately. This engine has main transfer passages symmetrically disposed with respect to a diametral plane of the cylinder which plane passes through the center of the exhaust port. The flow converges towards a first point on a first generatrix of the cylinder diametrically opposite to that through the center of the exhaust port. There is an auxiliary transfer passage of smaller cross-sectional area than the main passages and situated opposite the exhaust port and directing its flow towards a second point substantially opposite the first generatrix, the auxiliary passage containing the head of a fuel injector whose axis passes through the second point.

**40315** **APTIC NO. 64466**

Johnson, Cecil J.

METHOD AND APPARATUS FOR REDUCING NITROGEN OXIDE AIR POLLUTION. *(Assignee not given.) U. S. Pat. 3,782,115. 4p., Jan. 1, 1974. 7 refs. (Appl. Sept. 30, 1970, 1 claim).*

This invention relates to a process and apparatus for purifying the exhaust gases from an internal combustion engine prior to their being vented to the atmosphere. None of the earlier devices or methods have proven to be either practical or capable of performing the job for which they were intended. The exhaust gases are cooled, first by an air precooler and then by a refrigerant cooler, and a substantial portion of the water vapor present in the exhaust gas stream condenses. The exhaust gas stream is then passed through a contactor whereby the gases are intermingled with the condensed water. Nitrogen dioxide in the gases is dissolved to form nitric acid which may be collected. The gases and nitrogen dioxide-containing liquid are separated in a cyclone separator.

**40316** **APTIC NO. 64553**

Jones, Robert E.

ADVANCED TECHNOLOGY FOR REDUCING AIRCRAFT ENGINE POLLUTION. *National Aeronautics and Space Administration, Cleveland, Ohio, Lewis Research Center, NASA TM X-68256, 21p., 1974 (?). 16 refs. (Presented at the American Society of Mechanical Engineers, Winter Meeting, Detroit, Mich., Nov. 11-15, 1973.)*

NTIS: N73-26797

The research efforts conducted and sponsored by NASA to develop new low-emission combustor technology are described. The proposed Environmental Protection Agency regulations covering the allowable levels of emissions will require a major technological effort if these levels are to be met by 1979. Pollution reduction technology is being pursued by the NASA through a combination of in-house research, contracted programs, and university grants. In-house research with the swirl-can modular combustor and the double annular combustor has demonstrated significant reduction in the level of nitrogen oxides emissions. The work is continuing in an attempt to further reduce these levels by improvements in module design and in air-fuel scheduling. Research on the reduction of idle emissions has included the conversion of conventional duplex-fuel nozzles to air- assisted nozzles and an exploration of the potential improvements possible with fuel staging and variable combustor geometry. A major contracted effort is the Experimental Clean Combustor Program which is evaluating the potential emissions reduction of a wide variety of combustor designs. The program goal is a 75(+)% reduction in the level of NOx emissions at take-off and a 50% reduction in the level of idle pollutants from the present day levels for large turbofan engines. (Author summary modified)

**40317** **APTIC NO. 64922**

Kadota, Noriaki

EXHAUST GAS CONTROL DEVICE. *(Haiki gasu kisei sochi). Text in Japanese. (Nisshin Industries (Japan)) Japan. Pat. Sho 49-22241. 3p., June 7, 1974. (Appl. Nov. 28, 1969, 1 claim).*

Toxic components such as carbon monoxide and incompletely oxidized hydrocarbons contained in automotive exhaust gas are removed by recombustion in the reactor muffler. However, the combustion is almost complete in the presence of oxygen exceeding the stoichiometrically equivalent amount. Therefore, the aftertreatment of exhaust gas is unnecessary in such cases. In the system of this invention, the exhaust gas is led into the reactor muffler only when the toxic gas content exceeds the pollution control standard, and exhaust gas containing less toxic gases than the control standard is emitted directly through a regular muffler using a flow dividing valve. An exhaust gas sampling pipe leading to an air-fuel ratio meter or other type of detector is attached to the exhaust pipe at a short distance from the exhaust manifold, and a flow dividing valve is placed at the end of the exhaust pipe leading to the reactor muffler and regular muffler. The flow dividing valve is controlled by the amplified signal from the toxic gas detector, switching the valve according to the toxic gas level. The air-fuel ratio may be measured using the sample from the carburetor system, since a linear relationship is found between the air deficit in the air fuel intake and the amount of CO and incompletely oxidized HC in the exhaust gas.

**40318** **APTIC NO. 64644**

Kaeppler, Gerhard, Stefan Ficker, and Wilfried Werner Pergande

APPARATUS FOR FILTERING GASES HAVING A MOVABLE FILTER BAG UNIT. *(The Slick Corp., New York) U. S. Pat. 3,788,046. 10p., Jan. 29, 1974. 3 refs. (Appl. Dec. 2, 1971, 1 claim).*

A filter apparatus for the separation of gas from suspended solid particles by filter bags including a housing with a filter chamber is described. The filter chamber includes two chambers; the particle laden gas enters the first one and the cleaned gas is withdrawn from the second one after the suspended solid particles are removed by the filter bags. The movable unit includes a gas impermeable filter bag support sheet which forms a dividing wall between the first and second chambers. The filter bags are mounted on the support sheet. The economical construction of the filtering device allows for convenient checking of filter bags, cleaning and repair from outside the filter chambers in a time and labor saving manner, and avoids the disadvantages of time loss and hazards to health inherent in cleaning and repair in the relatively confined filter chamber. (Author abstract modified)

**40319** **APTIC NO. 63257**

Kaneko, Yasuo, Hiroyuki Kobayashi, Reijiro Komagome, Mitsuhiro Kawagoe, and Kazuo Koga

THE EFFECTS OF EXHAUST GAS RECIRCULATION AND OF RESIDUAL GAS ON ENGINE EMISSION AND PERFORMANCE. *Tech. Rev., 11(1):28-38, Feb. 1974. 4 refs.*

The results of emission control studies using an experimental combustion vessel and a single cylinder engine are described. In the vessel test, the effects of oxygen-nitrogen variations on nitrogen oxide formation were studied. The predominant factors were confirmed, and the tendency for nitrogen oxide reduction in over-lean and over-rich combustion was clarified. In the engine test, NOx reductions by exhaust gas recirculation (EGR) and by engine modification were compared with the vessel study. Nitric oxide formation depended on oxygen and nitrogen concentrations in the burned gas and on combustion temperature. If carbon dioxide was introduced into the mixture to lower the combustion temperature, the increase in its introduced amount made the excess oxygen rate approach one, at which NOx concentration was maximum and NOx reduction rate was lowered. If CO2 in the combustion chamber gases during the compression stroke prior to ignition was measured, it was possible to determine a total EGR rate including the residual gas irrespective of internal or external EGR. At a fixed amount of intake air, the increase in CO2 meant that heat capacity of burned gas in the cylinder and EGR rate in the cylinder were increased. Thus, NO reduction due to CO2 increase was caused by the increase in heat capacity of the burned gas. When CO2 was constant, NO reduction due to internal EGR through a valve overlap was approximately equal to that due to external EGR. Hydrocarbons were increased by the increase in external EGR, and carbon monoxide did not depend on the EGR rate, but mainly on the air/fuel ratio. (Author conclusions modified)

**40320** **APTIC NO. 64634**

Kasuga, Susumu, Mutsuo Koizumi, Naomi Yamaki, Naoyuki Fujido, Keiji Kurosawa, Toshiki Hatanaka, and Go Yamada

A PANEL DISCUSSION ON NITROGEN OXIDES EMISSION CONTROL TECHNIQUES. *(Chisso sankabutsu no haishutsu boshi gijutsu ni kansuru paneru disukasshon). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 10(5):34-49, May 1974.*

Nitrogen oxides emission control techniques were discussed by panelists, followed by a question and answer session. The complexity of combustion reaction and 3 formation mechanisms of NOx, thermal nitric oxide, fuel NO, and prompt NO, were discussed along with the effect of oxygen concentration, combustion temperature, residence time, and fuel nitrogen content. Three reduction methods in NOx formation are the exhaust gas recirculation combustion, multistage combustion, and prompt mixing combustion methods. The NOx formation increases with the increase in O2 concentration, combustion temperature, and residence time. Therefore, the control measures are reducing the maximum combustion temperature, regulating the air-fuel ratio, and adjusting ignition time. the NOx control standard in U.S.A. and in Japan are compared, and technical problems common to both countries in controlling automobile exhaust gas are described. Dentrification methods (catalytic decomposition, adsorption, absorption, and catalytic reduction) are evaluated, and the catalytic reduction method is considered to be potentially the most effective. Effects of the coexisting water vapor, O2, and other gases, ratio of NO and nitrogen dioxide, and type of reducing agents are discussed. Nitrification using potassium permanganate is discussed in terms of reaction mechanism and results obtained at the test plant. The development process and test results of low NOx burners based on the surface

**40321** **APTIC NO. 64853**

Katell, Sidney, Reid Stone, and Paul Wellman

OIL SHALE-A CLEAN ENERGY SOURCE. *Quart. Colo. Sch. Mines, 69(2):1-19, April 1974.*

The purification and refining of oil shale for use as an energy source are discussed. Activated carbon is used for removal of hydrogen sulfide from the retort gas. The gas streams from the hydrogenation, delayed coking, and distillation contain sulfur and nitrogen available for recovery in the form of $H_2S$ and ammonia. An $NH_3$ water wash is used to remove the $H_2S$ from the coker and distillate gases, and a water wash is used to extract the $NH_3$ and $H_2S$ from the hydrogenation gas. The combined $NH_3$-$H_2S$ solution is heated to drive off the $H_2S$ which is scrubbed with sulfuric acid to remove traces of $NH_3$. The $H_2S$ is reacted with air in a Claus kiln to form sulfur which is recovered as a hot liquid and stored for sale. Ammonia is also recovered and sorted for sale in liquid form. About 89% of the washed gas from the gas treating section is steam reformed to produce the hydrogen needed for hydrocracking. The gas used for $H_2$ generation is converted to produce 76% of the $H_2$ theoretically available with complete conversion of the gas. Costs are cited.

**40322** **APTIC NO. 64470**

Kates, Frank F. and George E. Faber

INTERNAL COMBUSTION ENGINE WITH MODIFIED AND CONTROLLED EXHAUST. *(Krun Corp., Sante Fe Springs, Calif.) U. S. Pat. 3,786,635. 6p., Jan. 22, 1974. 10 refs. (Appl. Dec. 20, 1971, 7 claims).*

This invention provides a novel internal combustion engine with modified and controlled exhaust, which does not pollute the atmosphere with any noxious or harmful pollutants. The engine can be operated fully closed insofar as the exhaust to the atmosphere is concerned, or with only a partial venting of the exhaust of the engine to the atmosphere, i.e., in the neighborhood of up to about 20%, containing no harmful or noxious pollutants. Any conventional fuel, leaded or unleaded, can be used. The exhaust gases and fluids from the engine which is using gasoline and air as fuel, are passed through a metal screen and a bed of activated carbon whereby a modification of the gases occur, then through a condenser where water and solids are removed. From zero to 20 percent of the gases leaving the condenser are exhausted to the atmosphere and the remainder is returned to the engine for reuse in the combustion process. (Author abstract modified)

**40323** **APTIC NO. 64927**

Kawasaki, Hideo, Masaji Nakatani, and Toshihiro Ishii

THE NISSAN ENGINEERING LTD. DENITRIFICATION METHODS. *(NE-shiki dasshoho). Text in Japanese. Sekiyu Gakkai Shi (J. Japan Petroleum Inst. (Tokyo)), 17(6):63-66, June 1974. 2 refs.*

The NE series is a series of denitrification methods developed by Nissan Engineering, Ltd. A pilot plant was constructed and a number of absorbents and absorption methods were tested. Under the test .condition of 2400-238 ppm of nitrogen oxides and an 80-90% of nitric oxide/$NO_x$ ratio, a packed tower and sodium chlorite solution or alkaline water solution of potassium permanganate worked best. Since sodium chlorite is unstable and sometimes produces chlorine gas, $KMnO_4$ was used for developing this system. There are four main processes in the series. The NE-A process is utilized for treating a relatively small amount of flue gas containing various types of impure gases. The system consists of a flue gas entrance, a scrubber, an alkaline absorption tower, and the NE absorption tower with $KMnO_4$ and caustic soda. Other systems are all modifications of this basic type. The NE-B process is used for the treatment of excessive amounts of NO. Since the consumption of $KMnO_4$ is large, a simple recovery process for $KMnO_4$ is combined in the system. The NE-C process is a relatively simple system designed for the treatment of a small quantity of gas containing a large amount of carbon dioxide. The NE-D process combines the process with the alkaline recovery system of nitrate electrolysis and a recovery system for manganese dioxide.

**40324** **APTIC NO. 64677**

Kawasaki, Teruo

GAS-FIRING SMOKELESS AND ODORLESS WASTE INCINERATOR. *(Gasudaki haikibutsu muen, mushu shokyakuro ni tsuite). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 41(5):449-453, May 1974.*

Waste incinerators ranging from a capacity of 5 to 20 kg/hr to a capacity of 100 to 300 kg/hr which use gaseous fuels such as city gas as an auxiliary fuel are described. These incinerators consist of three rooms and are designed to remove all smokes. Effective secondary combustion is performed by the complete mixing of city and combustion gases, and secondary and tertiary combustion by forcing air alone into the high temperature gas. Three incinerators were tested on the emission of dust, smoke, and odors from disposal of garbage, waste papers, and old clothes. Soot and dusts generated from these wastes were generally less than 0.2 g/N cu m. Efficient reduction of soot and dust emissions was due to the afterburning of the soot. The third combustion room below the fire flue is made as large as possible so that the flow rate of gas is less than 1 m/s in order to prevent the soot and dust from scattering. This type incinerator is not suitable for plastic wastes which tend to emit not only high temperature gases but also large amounts of smoke and soot.

**40325** **APTIC NO. 63314**

Khadzaragov, A. P., G. V. Totrov, I. D. Alborov, and M. M. Sabatkoyev

STUDY OF DUST-GENERATING FACTORS AND MEASURES FOR CLEANING THE AIR USED FOR MINE VENTILATION. *(Isseldovaniye pyleobrazuyushchikh faktorov i meropriyatiya po ochistke vozdukha, podavayemogo v rudnik). Text in Russian. Gorn. Zh., no. 2:50-52, 1974. 4 refs.*

The sources of dust in the air admitted to a zinc and lead ore mine, and complex measures taken for dust concentration abatement are described. Erosion-generated dust and dust generated by trucks and the ore discharge equipment near the air intake opening of the fan were the major sources of dust in the air that is admitted to the mine through a high-efficiency EPM-55 model electrostatic dust precipitator. While sprinkling the ground around the air intake proved ineffective, coating the road surface with polyalkylbenzene resin (an insoluble binding agent), treating the ore with stable foam for reducing the dust release, and treatment of the air to be admitted to the mine with 0.2% solution of polyacrylamide exposed to magnetic field for the removal of finely dispersed dust were highly efficient measures for the abatement of the vent air dust concentration.

**40326** **APTIC NO. 63135**

Kimura, Fumio

FILTER TYPE DUST COLLECTION. *(Rokashiki shujin). Text in Japanese. Preprint, Japan Soc. of Chemical Engineers, Tokai Branch, Nagoya, p. 30-34, 1974. (Presented at the Japan Society of Chemical Engineers, Tokai Branch, Study Meeting on Behavior of Microparticles and Dust Collection, 32nd, Nagoya, Japan, Jan. 25, 1974.)*

Studies were made on the mechanical properties of various fabrics of bag filter designed for industrial dusts of high concentrations. The dynamic functions of filter fabric, the weaving structures and filter characteristics, the effects of flow rates, pressure losses, filter resistance, dust collection efficiency, dust shaking characteristics, and pressure loss by residues, are analyzed mathematically. The selection of filter fabrics includes cotton, wool, various synthetic fabrics, and glass, but the comparison of mechanical properties shows that the silicon treated glass is most advantageous, with its low inflammability, a high maximum temperature limit of 270 C, and relatively high chemical resistance against acids, alkali, and bacteria. Teflon is also excellent with its low inflammability, a maximum temperature limit of 230 C, and extremely high chemical resistance. The worse fabrics are cotton and wool. Among the synthetics, polypropylene is the least desirable, with its high inflammability and low maximum temperature limit of 90 C. Dust collection by filter bag is relatively low in cost and high in efficiency.

**40327** **APTIC NO. 64696**

Kisters, Th. and H. H. Hebbel

### LIMITING EMISSION IN CONNECTION WITH WASTE INCINERATING PLANTS: EXPERIENCE GAINED WITH A PILOT PLANT FOR THE DISPOSAL OF NOXIOUS GASES.

*(Emissionsbegrenzung an Abfallverbrennungsanlagen - Erfahrungen mit einer Pilotanlage fuer die Schadgasbeseitigung). Text in German. Aufbereitungs Technik, 15(5):229-233, 1974.*

A gas scrubber pilot plant was installed in the incinerator operated by the city of Duesseldorf. The plant should help to determine the efficiency of the scrubbing method concerning elimination of hydrogen chloride, hydrogen fluoride and sulfur dioxide. Of these pollutants, the following weight fractions per cubic meter are measured in the flue gases from incinerators: up to 2000 mg hydrochloric acid, up to 1000 mg sulfur dioxide, 20 mg hydrogen fluoride and 400 to 500 mg nitrogen oxides. The flue gases which come from the electrostatic precipitator with a temperature of 280 C are cooled to 75 to 80 C and passed through a venturi scrubber and a droplet separator. The results indicate an increase of the HCl collection efficiency with increasing water quantity. At a stepwise artificial increase of the HCl concentration in the uncleaned gas to 5 g/cu m the HCl concentration in the cleaned gas rose as anticipated but the collection efficiency improved too. The collection efficiency for SO2 too depended on the water quantity and on the pH value of the scrubbing water. The residence time in the scrubber was too short to obtain any higher collection efficiency than 60 percent. Through installation of a second scrubbing stage an essential improvement of the SO2 collection efficiency was achieved. Experiments are still in progress so that no final results can be given.

**40328** **APTIC NO. 64621**

Knoll, Herbert

### MOLECULAR SIEVES - MODERN ADSORBENTS.

*(Molekularsiebe - moderne Adsorbenzien). Text in German. Chem. Tech. (Berlin), 26(7):391-396, July 1974. 56 refs.*

The fields of application and importance of molecular sieves in various industrial branches are outlined by means of selected examples with special regard to the application of the Zeosorb molecular sieve in the German Democratic Republic. The latter is widely used for drying of gases and liquids. Molecular sieves can be used for gas cleaning and separation. Sulfur compounds such as hydrogen sulfides, mercaptans, organic sulfides, and disulfides can be reduced from an initial concentration of 2000 ppm to less than 2 ppm. Desulfurization units usually operate with high pressure (up to 200 atm) and normal temperature. In 1972, after a construction period of 2 yr the first natural gas desulfurization plant was put into operation in the German Democratic Republic near Gotha. As molecular sieve Zeosorb 5A is used. The natural gas is dried and desulfurized in one step. The plant comprises 4 adsorbers operating with a pressure of 35 atm, an adsorption temperature of 20 to 25 C, and a throughput of 15,000 to 33,000 cu m/h. Recently 3 important methods called Pura Siv have been developed using molecular sieves for the adsorptive removal of sulfur dioxide, nitrogen oxides, and mercury from waste gases and waste water. In 1973 the first large scale plants were put into operation. Other fields of application of molecular sieves are catalysis and the separation of hydrocarbons.

**40329** **APTIC NO. 61428**

Kobana, Teruji

### DEODORIZATION BY CATALYTIC COMBUSTION.

*(Shokubai nensho dasshu ni tsuite). Text in Japanese. Akushu No Kenkyu (Odor Research J. Japan), 3(13):16-25. Jan. 1974.*

A catalytic incinerator consisting of a burner which preheats the gases in a mixing chamber from 600 C to 900 C, and a catalytic layer, which oxidizes the waste gases is described. It requires less than 60% of the fuel consumption of a direct-fire incinerator. However, the running costs of the two are almost the same. To maintain top efficiency of the incinerator, chemicals (such as lead, mercury vapor, phosphorus, silicon, and detergents) which are poisonous to the catalyst must be removed from the gases before treatment. A total conversion of approximately 85% is usually required for this type of incineration. A typical apparatus uses platinum and alumina supported on a ceramic matrix to convert hydrogen, carbon monoxide, methane, and other hydrocarbons. High conversions of H2, CO, CH4, and HC solvents are generally achieved at 300 to 500 F, 500 to 800 F, 1100 to 1300 F, and 750 to 1100 F, respectively.

**40330** **APTIC NO. 64472**

Koberstein, Edgar and Eduard Lakatos

### CATALYST FOR PURIFICATION OF EXHAUST GASES FROM MOTOR VEHICLES AND INDUSTRIAL PLANTS.

*(Laporte Industries Ltd., London (England) and Deutsche Gold- und Silber-Scheideanstalt, Frankfurt (Germany)) U. S. Pat. 3,787,322. 8p., Jan. 22, 1974. 13 refs. (Appl. Jan. 25, 1971, 18 claims).*

A catalyst composition for use in oxidative reactions at high temperatures as in the oxidation of exhaust gases from internal combustion engines is described. The composition consists of a substantially homogeneous mixture of aluminum oxide of cubic structure, an oxide of copper and chromium, and optionally at least one compound of at least one other element of Group IIa of the Periodic Table. The aluminum oxide acts as a catalytically active binder, rather than a carrier substance as in other catalysts. The aluminum oxide effect on the catalytic properties of the system may be due to a partial formation of prephases which contain mary catalytic active centers. This function of the aluminum oxide plus the smaller size (0.5 to 5 micron) of the copper and chromium oxide are improvements over other catalysts. (Author abstract modified)

**40331** **APTIC NO. 63212**

Kobylinski, Thaddeus and Brian W. Taylor

### THE CATALYTIC CHEMISTRY OF NITRIC OXIDE. II. REDUCTION OF NITRIC OXIDE OVER NOBLE METAL CATALYSTS.

*J. Catalysis, 33(3):376-384, June 1974. 9 refs.*

The reduction of nitric oxide with hydrogen, carbon monoxide, and an equimolar mixture of H2/CO over supported platinum, palladium, ruthenium, and rhodium catalysts was studied. The activity sequence of the catalysts was Pd greater than Pt greater than Rh, greater than Ru, when H2 was used as the reducing agent. When CO or a CO/H2 mixture was used, this activity sequence was reversed. Carbon monoxide inhibited NO reduction strongly over Pt and Pd but to a lesser extent over Rh. Over the Ru catalyst, the presence of CO accelerated the reaction. The reduction of NO in the presence of Pt and Pd gave ammonia as a major reaction product. Rhodium and especially ruthenium catalysts were selective toward nitrogen formation. The material balance obtained for the Ru catalyst indicated that most of the NO reacted with H2, even if CO was present. Comparative test runs indicated that NH3 decomposition was not responsible for the high selectivity toward N2 observed with Ru and Rh catalysts. A reaction mechanism, not involving the ammonia decomposition step, is proposed. (Author abstract)

**40332** **APTIC NO. 64464**

Koppang, Richard R. and Harland L. Burge, Jr.

BURNER ASSEMBLY FO? PROVIDING REDUCED EMISSION OF AIR POLLUTANT. *(TRW Inc., Redondo Beach, Calif.) U. S. Pat. 3,787,168. 5p., Jan. 22, 1974. 4 refs. (Appl. Aug. 23, 1972, 5 claims).*

This invention relates to burner assemblies that provide desired flame characteristics which reduce the emission of gaseous and particulate air pollutants. A pair of conduits, coaxially arranged, provide flow paths for carrying combustible reactants to a combustion zone. The central conduit, other wise known as a distribution tube, extends to within the combustion zone and includes a disc element at the combustion zone end for deflecting an oxidizing reactant moving axially along the exterior of the distribution tube. A fuel reactant introduced into the combustion tube is carried to the combustion zone end where it issues through radial ports and impinges the oxidizing reactant to produce a hollow cone flame. A mixing element is included within the distribution tube to impart centrifugal motion to liquid fuels which are then subject to being atomized in the region of the radial ports. Temperature condition of the fuel-atomizing gas may optionally be performed to reduce liquid fuel surface tension and to promotive vaporization. (Author abstract

**40333** **APTIC NO. 63404**

Kumagai, Seiichiro

PURIFICATION OF AUTOMOBILE ENGINE EXHAUSTS. *(Jidosha kikan no haiki joka ni tsuite). Text in Japanese. Preprint, Automobile Technical Assoc., Tokyo, p. 293-298, 1974. (Presented at the Japan Automobile Technical Association, Lecture Meeting, Tokyo, Japan, May 1974, Paper 40.)*

With a modified engine, the simultaneous attenuation of carbon monoxide and hydrocarbons from exhaust can be achieved by supplying excess air to one cylinder and under-ratio air into the paralleling cylinder. Both cylinders are sparked simultaneously. Exhausts are led to the heat reactor and the amount of CO and HC are reduced by collision oxidation. The amount of nitrogen oxides is already reduced in the cylinders and does not increase with this reaction. For this, excess air should be about 12, and under-ratio air should be about 21, and the total mixture ratio should be 15-16. The spark time should be delayed as much as possible, as long as the heat reactor functions. Various experiments were conducted using two modified engines and using this method. The results were generally the same as four-cylinder cars. Then, an automobile weighing 2750 lbs was tested for 10-mode operation. The CO emission was several hundred mg/km, HC was 30-40 mg/km and even 5-6 mg/km frequently. The NOx emission was inversely proportional to the fuel consumption, but allowing for a 30% fuel consumption increase, it could be held down to 0.20-0.22 g/km.

**40334** **APTIC NO. 63301**

Lardit, F.

INDUSTRIAL DUST SEPARATION. *(Le depoussierage industriel). Text in French. Pollution Atmos. (Paris), 16(61):21-37, Jan.-March 1974.*

A general description is given of cyclones and electrostatic precipitators with preliminary ionization with special regard to their use for dust separation in industrial combustion equipment. Formulas for the determination of the smallest possible particle to be captured by cyclones are given. In parallel-connected cyclones, uniform velocity distribution among the individual cyclones is required. Multicyclones composed of a number of small-size cyclones have the advantage of providing high centrifugal forces, but they require uniform velocity distribution even more than parallel cyclones. Currently, cyclones and multicyclones are applicable for temperatures up to 400 C, for a particle size range of 5-20 micron, a pressure loss of 40-100 mm water column, and have efficiencies ranging from 80 to 95%. Multicyclones are suitable for dust separation from fuel oil-fired boiler flue gases. Electrostatic precipitators with a separate preionization zone are currently used for particulate separation from flue gases of combustion equipment.

**40335** **APTIC NO. 64692**

Leith, William Cumming

ROTATING CONCENTRIC HOMOGENEOUS TURBULENCE FABRIC BAG GAS CLEANING METHOD. *(Assignee not given.) U. S. Pat. 3,785,123. 5p., Jan. 15, 1974. 1 ref. (Appl. Feb. 7, 1972, 3 claims).*

A method of utilizing Taylor circular couette motion caused by centrifugal forces in a rotating concentric homogeneous turbulence fabric bag gas cleaner to provide uniform separation of gaseous, liquid, and solid particulates in a carrier fluid is described. This method differs from the usual classical couette motion with stagnant or longitudinal flow between the rotating concentric cylinders in that it uses radial flow through the perforated cylinders. It is an improvement on present day fabric bag gas cleaners because it uses a final uniform separation by couette motion in addition to the usual fabric bag separation. The rotation speed, the number and diameter of the performations together with the perforation pattern and percent perforated area can be optimized for specific applications. (Author summary modified)

**40336** **APTIC NO. 64693**

Leith, William Cumming

ROTATING CONCENTRIC HOMOGENEOUS TURBULENCE ELECTROSTATIC PRECIPITATION GAS CLEANER METHOD. *(Assignee not given.) U. S. Pat. 3,785,118. 5p., Jan. 15, 1974. 6 refs. (Appl. Feb. 7, 1972, 2 claims).*

A method of utilizing Taylor circular couette motion caused by centrifugal forces in a rotating concentric homogeneous turbulence electrostatic precipitation gas cleaner to provide uniform separation of gaseous, liquid, and solid particulates in a carrier fluid is described. This method differs from the usual classical couette motion with stagnant or longitudinal flow between the rotating concentric cylinders in that is utilizes radial flow through the perforated cylinders and a final uniform separation by couette motion in addition to the usual separation by electrostatic precipitation. There is an imposed residence time for uniform separation. The rotation speed, the number and diameter of the perforation together with the perforation pattern and percent perforated area can be optimized for specific applications. (Author summary modified)

**40337** **APTIC NO. 64949**

Lester, George Ronald

IMPROVED METHOD AND APPARATUS FOR TREATING I.C. ENGINE EXHAUST GAS. *(Universal Oil Products Co., Des Plaines, Ill.) Brit. Pat. 1,349,088. 6p., March 27, 1974. (Appl. June 28, 1971, 11 claims).*

This invention relates to a method and system for treatment of internal combustion engine exhaust gases, in which a secondary fuel is injected into the exhaust gas stream upstream of a catalytic conversion zone. The addition of the secondary fuel increases the conversion zone temperature to effect substantially complete combustion of the undesirable material in the exhaust gases without separate ignition systems. The system has a catalytic converter with an inlet for introducing exhaust gases into the converter, a catalyst-retaining section with a catalyst material communicating with the inlet and a gas outlet communicating with the catalyst retaining section for discharging treated exhaust gases, a secondary fuel injector, and a temperature-dependent condition sensor. A secondary fuel supply means connected to the fuel injector is characterized in that the sensor controls the supply means to ensure that the flow of the secondary fuel is not permitted before the temperature of the converter is such that substantially immediate initiation of combustion of the secondary fuel in the presence of the stream of gases in the catalyst-retaining section will occur.

**40338** **APTIC NO. 64911**

Lewis, Clifford J.

AQUEOUS LIME SCRUBBER SIMPLIFIES SULFUR DIOXIDE REMOVAL. *Rock Prod., 77(7):72-75, July 1974. 3 refs.*

A technological and economic evaluation of lime versus limestone for sulfur dioxide removal by scrubbing is presented along with a description of an aqueous lime scrubber which does not plug with scale and particulates. Lime exhibits excellent stoichiometry in gas scrubbing operations and is much more economical than limestone from the standpoint of transportation and application, since the unwanted burden of carbon dioxide is driven off during the calcining operation. The relative neutralizing value of limestones and limes in terms of basicity factors are tabulated for various liming materials and range from 1.12 for Dolomitic quicklime to 0.54 for high-calcium pulverized limestone. Major cost items are also listed for lime versus limestone. A scrubber which operates efficiently on lime slurry is described. It consists of a horizontal rotating tube patterned after a rotary lime kiln. Chain suspensions which gently police the inside walls of the cylinder and also continuously flex as the cylinder rotates are located in the interior of the cylinder. The arrangement allows for the collapsing chains to dip into the pool of aqueous lime slurry in the bottom of the cylinder and carry the slurry as the cylinder rotates, permitting absolute control of the retention of the aqueous scrubbing medium within the cylinder since its rate of discharge is completely dependent on the rate at which the aqueous scrubbing medium is pumped into the cylinder.

**40339** **APTIC NO. 64890**

Loehner, Kurt and M. Elsayed-Ahmed

EVAPORATION, DROPLET AND FILM FORMATION IN CARBURETORS. *(Verdunstung, Tropfen- und Filmbildung in Vergaseranlagen). Text in German. Motortech. Z. (Stuttgart), 35(6):186-192, 1974.*

Carburetor and intake pipe are important for mixture preparation and mixture distribution in Otto engines because they atomize the fuel, mix the droplets with air, transport the droplets, precipitate part of the droplets on the pipe wall and evaporate part of the droplets and the wall deposits. For determination of the condition of the mixture behind the carburetor, a Solex carburetor type PDSIT-6, carburetor measurement equipment was built. The film was separated with the aid of a catching ring and subsequently measured. The droplet and vapor fraction was sampled with a specially developed probe at many points of the pipe cross section. The mixture and vapor samples were separately analyzed with a flame ionization detector. The measurement results show that with increasing distance from the carburetor the droplets are pressed from the pipe center to towards the wall. The film formed preferentially in those pipe sections with the largest droplet mass flow gradients. Through increase of the air velocity, the film mass fraction decreased. The droplet mass fraction increased at first, reached a maximum at medium air velocities and dropped again. The vapor mass fraction depends on the droplet size and the residence time. Through higher temperature of air or fuel, evaporation increases. A mass balance of the fractions droplets, vapor, and film in the various mass cross sections behind the carburetor was attempted. The mass balance was characterized by uncertainty. The movement of the droplets in an air flow was calculated with the aid of a model. A computer program for calculation of the evaporation of an isooctane droplet cluster in an air flow was worked out which takes into account simultaneous heat and substance transfer between the air and the droplets. The precipitation of droplets on the wall was neglected. A number of calculated examples reveals the influence of various factors on the evaporation of the droplets such as air ratio, air velocity, droplet diameter, air temperature and pressure as well as fuel temperature.

**40340** **APTIC NO. 64767**

Lyon, Richard S. and Ralph L. Lyon

METHOD FOR CLEANING A GAS. *(United McGill Corp., Columbus, Ohio) U. S. Pat. 3,789,109. 11p., Jan. 29, 1974. 6 refs. (Appl. Aug. 13, 1971, 23 claims).*

A method and apparatus for cleaning air contaminated with solid, liquid, and/or gaseous pollutants derived from a hot-end coating station of a glass article manufacturing facility are described. Glass bottles which were breaking excessively were coated with an external metallic coating that substantially increases the impact strength of the bottles but creates pollution problems, as a substantial percentage of the anhydrous stannous chloride used does not adhere to the bottles but passes through the coating hood and is subsequently carried away by an air exhaust system. Prior to this invention, there was no known feasible and economical system for performing the task satisfactorily within the requirements established by pollution control standards. In this process, the air is heated to convert the metallic chlorides to metallic oxides and hydrogen chloride gas and then conveyed to a gas scrubber. Before entering the scrubber, fresh water is sprayed into the air to rapidly cool the air and the water reacts with the hydrogen chloride gas to form hydrochloric acid. The scrubber employs water to wash and scrub the air and remove the pollutants from the air. (Author abstract modified)

**40341** **APTIC NO. 64498**

Mackinger, H.

STANDARIZED INTEGRAL PLANTS FOR THERMAL AND CATALYTIC AFTERBURNING. *(Standardisierte Integral-Analgen fuer thermische und katalytische Nachverbrennung). Text in German. Umweltschutz Staedtereinig. (Vienna), 1974(7):163-165, 1974.*

Afterburning can be applied in all cases where oxidation leads to harmless products. This is the case when carbon-hydrogen, carbon-hydrogen-oxygen and carbon-hydrogen-nitrogen compounds are completely burned yielding end products such as carbon dioxide, water, and nitrogen. Afterburning becomes a problem when the organic compounds contain substances whose oxidation products are air pollutants; such substances are halides and sulfur and sometimes also heavy metals. In such cases the concentration in the combustion products must be measured to see whether valid limit concentrations are exceeded or not. If they are exceeded, afterburning cannot be applied or it must be succeeded by a scrubbing process. For achieving complete combustion an adequate reaction temperature and residence time is required. Afterburning can be either thermal or catalytic. For determining which of the two methods is to be applied the waste gas composition must be known. Standardized afterburners for an hourly throughput of up to 20,000 cu m air are described. They comprise a combustion chamber, a reaction chamber either holding the catalyst or being used for final combustion in thermal afterburners, and the heat exchanger. The size of the combustion chamber matches the waste gas quantity, that of the reaction chamber the required residence time. These compact afterburners are made of stainless steel and are equipped with

**40342** **APTIC NO. 64446**

Maejima, Hiroshi

ON AN EXHAUST DUST DESULFURIZER BY MEANS OF ACTIVATED CARBON OPERATED BY KASHIMA THERMAL POWER PLANT. *(Kashima karyoku hatsudenjo ni okeru kasseitan-ho (suisen-shiki) haien datsuryu sochi ni tsuite). Text in Japanese. Boira Gishi (Boilermen), 29(5):401-409, May 1974.*

The exhaust gas desulfurizer of the Kashima thermal power plant consists of large scale experimental equipment capable of treating 420 thousand N cu m/hr. Various studies are being made centering on the efficiency of the exhaust gas desulfurizer, connected directly to electricity generating equipments, in terms of long- term continuous operation. The experimental equipment consists of six desulfurizing towers packed with activated carbon, eight washing tanks, and a neutralizing tank with sulfuric acid. The desulfurizers employed are classified roughly into absorption, scrubbing, and neutralization. A breakdown of the total construction cost is given. The operating hours, desulfurizing rate, amount of limestone consumed, and gypsum produced in the whole operation are given.

**40343** **APTIC NO. 64688**

Mare, Ernest and J. Ronald Hershberger

SCRUBBING APPARATUS. *(Assignee not given.) U. S. Pat. 3,785,127. 7p., Jan. 15, 1974. 14 refs. (Appl. Feb. 22, 1971, 8 claims).*

An apparatus for scrubbing a stream of air or other gas with a scrubbing liquid (e.g., water) is described. The scrubbing is carried out in successive stages simultaneously with classification of the removed material. This is an improvement over other apparatus which require a separate slurry processing step for classification. The removed material is withdrawn as separate fractions. Each stage has a means for scrubbing the gas with liquid droplets and by impingement with surfaces wet with liquid. The droplets are eliminated so they are not delivered to the next scrubbing stage. The apparatus can remove particles in the minus 20 micron size range which eliminates the difficulty of other scrubbers in removing fine particles. (Author abstract modified)

**40344** **APTIC NO. 64509**

Masuda, Senichi

ELECTROSTATIC DUST COLLECTING APPARATUS. *(Onoda Cement Co., Ltd., Yamaguchi-ken (Japan)) Brit. Pat. 1,351,154. 6p., April 24, 1974. (Appl. July 23, 1971, 6 claims).*

A wet type electrostatic dust collector is described which overcomes the drawback of loss of gas buoyancy associated with similar prior art electrostatic collectors. The collector consists of a dust collecting chamber which has an inlet and outlet, electrostatic discharge electrodes, dust-collecting electrodes, a means for spraying at least the dust collecting electrodes with liquid, and a combustion means for producing hot combustion gases. The combustion means is located in the outlet such that hot combustion gases may be introduced into the outlet to heat gases passing through it from the chamber.

**40345** **APTIC NO. 64785**

Masuda, Senichi

A CURTAIN DEVICE FOR THE ELECTRIC FIELD. *(Denkai caten sochi). Text in Japanese. (Assignee no given.) Japan. Pat. Sho 49-18308. 7p., May 9, 1974. (Appl. Jan. 29, 1968, 1 claim).*

The electric field curtain which prevents the passage of charged particles while allowing the passage of gases is described. In the curtain device a group of insulated cylindrical electrodes is placed on a plane or curved surface, and a single phase or polyphase alternating voltage is applied to the alternating electrodes using a transformer. As a result, a stationary or non-stationary and nonuniform electric field is produced, which occupies a certain space and prevents the passage of charged particles through the area. The cross-section of the electrode may be circular, oval or some other shape with no sharp edges. The suspended particulates are charged beforehand using a corona discharge device. The electrodes may be arranged in various forms, and some of the examples are cylindrical electrodes arranged parallel to the cylindrical axis on the circumference of the cylinder for the cylindrical curtain, circular electrodes arranged on a concentric circle on the plane of the curtain, curved cylindrical electrodes arranged on the circumference of the curved cylindrical curtain, circular electrodes of the same size arranged in layers of equal distances, two intertwining spiral electrodes, circular electrodes of decreasing sizes arranged in a cone formation, and arrangements of irregular shapes of electrodes. A stationary electric field curtain is produced by a single phase alternating voltage, while a non-stationary curtain is produced by the use of a polyphase alternating voltage.

**40346** **APTIC NO. 64876**

Mathur, Kishan B. and Norman Epstein

DEVELOPMENTS IN SPOUTED BED TECHNOLOGY. *Can. J. Chem. Eng., 52(2):129-144, April 1974. 70 refs. (Presented at the American Institute of Chemical Engineers-Canadian Society of Chemical Engineers, Joint Conference, 4th, International Symposium on Spouted Beds, Vancouver, British Columbia, Sept. 9-12, 1973 and the International Congress of Chemical Engineering, 4th, Prague, Czechoslovakia, Sept. 1972.)*

Although the spouted bed was originally developed for drying coarse granular solids such as grains, wood chips, and polymeric materials, it can be used in a remarkably wide variety of operations. These include not only other diffusional and/or thermal operations such as heating or cooling of solids, drying of solutions and suspensions onto inert bed particles, particle coating, and granulation, but also certain mechanical functions such as solids blending, comminution, and aerosol collection from a gas stream. The spouted bed reactors can be used for several chemical processes as well, such as coal carbonization, shale pyrolysis, ore roasting, cement clinker production, and thermal cracking of petroleum. They can be used for gas cleaning in operations such as regeneration of spent adsorbent or removing particulates from gas. These and other applications and developments of spouted beds are reviewed. The particular features of spouted beds which play key roles in each type of application are identified, some new applications are suggested, and consideration is given to the future industrial potential of individual processes. (Author abstract modified)

**40347** **APTIC NO. 64768**

McCauley, Albert P.

CONTROL METHOD FOR FUME INCINERATORS. *(SCM Corp., Cleveland, Ohio) U. S. Pat. 3,789,104. 6p., Jan. 29, 1974. 4 refs. (Appl. Feb. 25, 1971, 12 claims).*

Improved process and apparatus are shown for incineration of combustible fumes to suppress deleterious, uncontrolled combustion of the fumes such as flashbacks and explosions due to the occurrence of an adventitious, transient fume overload. In response to upward deviation from a preselected incineration temperature, the fume feed flow is automatically throttled to bypass the incineration zone while the flow of primary incineration fuel has been automatically diminished, but at most only to a point short of the extinction of its combustion, thereby relieving the overload condition without disruptive operational discontinuity. An automatic temperature controller provides the particular sequential throttling control impulse to automatic throttling valves on primary fuel and bypass for this purpose, and also to an automatic throttling valve on flow of fume diluent vapors, if desired. When the combustion of primary fuel is restarted manually or automatically from shutoff, or even from a small pilot flame, disruptive combustion can occur. Various prior art safety devices installed near the incinerator are not always foolproof.

**40348** **APTIC NO. 64795**

McCubbin, Neil

AIR POLLUTION CONTROL IN THE SWEDISH PULP INDUSTRY. *Pulp Paper Mag. Can., 75(7):T258-T262, July 1974. 8 refs. (Presented at the Air and Stream Improvement Conference, 8th, St. Andrews, New Brunswick, Sept. 11-13, 1973.)*

Generally air pollution control problems are similar in Sweden to those in Canada, and in some aspects Swedish mills have experience and are employing different solutions to those current in Canada. Those of particular interest to Canadian mills include the use of scrubbers to control recovery boiler emissions and to generate hot water for process use, incineration of batch digester blow gases without utilizing any gas holders, and the use of government grants to promote installation of air pollution control facilities and to reduce unemployment at critical times. Kraft and sulfite mill control problems and control methods are reviewed. (Author abstract modified)

**40349** **APTIC NO. 64765**

**McIlvaine, Robert W.**

METHOD AND APPARATUS FOR REMOVING PARTICULATES AND OXIDES OF SULPHUR FROM GAS. *(Environeering, Inc., Skokie, Ill.) U. S. Pat. 3,785,119. 8p., Jan. 15, 1974. 11 refs. (Appl. Oct. 4, 1972, 25 claims).*

An improved method and apparatus for removing particulates and sulfur oxides from gas are described. The gas is treated in a wet scrubber with a mixture of limestone and water. Precipitates of calcium sulfite and/or calcium sulfate are formed and removed from the gas. The dry particulate material is removed in a dry separation stage and is intermixed with the wet precipitious materials. The calcium sulfite is well dispersed within the dry particulate or fly ash material. The percentage of calcium sulfate is less than 50% of the total mix and the material is of a consistency which is entirely suitable for land fill projects. In other limestone slurry processes, the wet precipitates remains wet and sloppy and unsuitable for use as a land fill material. (Author abstract modified)

**40350** **APTIC NO. 64647**

**Melkersson, Karl-Axel and Bo Gustav Valter Hedenas**

METHOD OF PURIFYING GASES CONTAINING MERCURY COMPOUNDS AND ELEMENTARY MERCURY. *(Boliden Aktiebolag, Stockholm (Sweden)) U. S. Pat. 3,786,619, 6p., Jan. 22, 1974. 3 refs. (Appl. June 1, 1972, 9 claims).*

A method of removing mercury compounds from roaster gases obtained when roasting Hg-containing sulfide ores is described. The Hg-containing gas is passed through a mass of purifying absorbent material containing as an active constituent a material consisting of selenium, selenium sulfide, or other selenium compounds or mixtures thereof. Other methods do not obtain the same very high degree of efficiency or they have the disadvantages associated with activated carbon. (Author abstract modified)

**40351** **APTIC NO. 63294**

**Meschke, Udo and Helmut Routschek**

REDUCTION OF THE DUST EMISSION FROM WET TYPE SEPARATORS BY THE USE OF MAGNETICALLY PRETREATED WATER. *(Verringerte Staubemission von Nassabscheidern durch Einsatz magnetisch vorbehandelten Wassers). Text in German. Neue Bergbautech., 4(4):300-302, April 1974. 5 refs.*

The efficiency of the magnetic pretreatment of the water to be used in wet type dust separators to increase dust separation efficiency of the latter was demonstrated in a coal-cake manufacturing plant under normal operating conditions. The water to be admitted to the wet type dust separator was magnetized by means of a Cepi model permanent magnet by Epurex. The initial dust concentrations admitted to the dust separator with and without magnetic pretreatment were 1.456 g/N cu m and 1.616 g/N cu m, respectively. The residual dust concentrations slipping through the dust separator with and without magnetic pretreatment of the water were 0.109 g/N cu m and 0.141 g/N cu m. The efficiency-increasing effect of the magnetic pretreatment of the water is due to the change in the dipole momentum of the water and in the electrophysical properties of the salt ions contained therein brought about by the magnetic field.

**40352** **APTIC NO. 64928**

**Miyagawa, Yasuhiro**

METHODS OF MANUFACTURING WATER USING EXHAUST GAS FROM LIQUEFIED NATURAL GAS THERMAL POWER. *(LNG karyoku no haien karano zosui). Text in Japanese. Denki Kyokai Zasshi (J. Japan. Elec. Assoc.), no. 606:28-31, April 1974.*

A new method of manufacturing water using exhaust gas from boilers is described. The principle is that of condensation caused by heat transfer. Since the summer season has a different moisture content in the air from that of the winter season, the amount of water in exhaust gas is larger in the summer. The more reduced the temperature of exhaust gas at the outlet, the more water can be withdrawn. Many cooling tubes are set vertically in the stack and drops of water produced on the surface of these tubes as the exhaust gas contacts the cooling water flowing inside tubes are collected. Another method is designed to produce water by contacting exhaust gas from an absorbing tower with cooling water sprayed from the top.

**40353** **APTIC NO. 64725**

**Miyazaki, Katsuji**

DEODORIZATION OF FLUE GAS FROM DRYING AND BURNING PROCESSES FOR WASTES (MAINLY RELATED TO THE LIVESTOCK INDUSTRY). *(Haikibutusu (shu to shite chikusan kankei) no kanso shokyaku katei ni okeru haigasu no dasshu). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 41(5):423-430, May 1974. 6 refs.*

The main sources of odorous emissions are chicken farms and hog yards (26.5%), fish animal bone treatment factories (16.4%), and the petrochemical industry. Most of the bad odors are organic gases and result from livestock waste, feed, food, fertilizers, and other wastes. In the combustion method of deodorization, an odorless dryer preheats fresh air to more than 250 C, raw material sent into a rotating cylinder is indirectly heated for drying, steam and odors emitted during drying are sent through a cooler where moisture and part of the odors are removed, and the flue gas is blown into a combustion room where secondary air is added to complete the oxidative decomposition of odorous substances. In the filter method, flue gas discharged from a dryer is sent underground to a trench constructed of concrete blocks and discharged to the air through a soil layer consisting of

**40354** **APTIC NO. 63249**

**Mohrmann, Hasso and Werner Marchlewitz**

THE AEROSOL LOAD OF FIBROUS FILTERS. *(Beladung von Faserfiltern mit Aerosolen). Text in German. Staub, Reinhaltung Luft, 34(3):100-102, March 1974. 6 refs.*

The flow resistance and the penetration of glass fiber-aerosol filters as a function of the aerosol burden deposited on the filter was studied by using 0.4 micron liquid (DOP) and solid (sodium chloride) aerosols. Rapid increase of the flow resistance with increasing solid aerosol burden was observed. However, the theoretical curve could not be confirmed. The flow resistance increased less rapidly with the increase of the degree of clogging for the liquid aerosol. Here, a clogging corresponding to an aerosol load equaling one third the filter weight was necessary to double the flow resistance.

**40355** **APTIC NO. 63125**

**Moore, Albert James, James Alexander Haggart, Jr., and Michael Ralph Foster**

CATALYTIC CONVERTERS FOR INTERNAL COMBUSTION ENGINE EXHAUST GASES. *(General Motors Corp., Detroit, Mich.) Brit. Pat. 1,344,969. 13p., Jan. 23, 1974. (Appl. Aug. 24, 1972, 13 claims).*

Catalytic converters for internal combustion engine exhaust gases were developed. The converter is formed by four metal sheets which are so constructed and arranged that only edge seals are required to form the retainer for the mass of catalyst and the gas flow passages through the converter. Typical catalysts used in exhaust gas converters do not generally become effective until the temperature of the catalyst has risen to about 250 F so that there is a time lag between the emission of exhaust gas from the engine on starting up and the beginning of the catalytic conversion of the exhaust gases, owing to the period required for heating up of the catalyst bed by the incoming exhaust gases. The construction of this converter assists in maintaining the temperature of the catalyst bed, and since the discharged gases contribute to the heating of the incoming gases by heat conduction, heat is contributed to the incoming gases by the treated gases on starting up of the engine and the time which elapses before the catalyst bed reaches start up temperature is thereby reduced, which increases the efficiency of the converter.

**40356** **APTIC NO. 64651**

Morgan, John Paul and Frank Edward Murray

PROCESS FOR THE CONTROL OF MALODOROUS EMISSIONS FROM KRAFT PULP MILLS. *(Chemech Engineering Ltd., Vancouver (British Columbia)) Brit. Pat. 1,353,909. 2p., May 22, 1974. (Appl. Aug. 22, 1970, 6 claims).*

A process for the control of water and air pollution in the operation of a kraft pulp mill is described. Bivalent sulfur compounds present in black liquor, e.g., hydrogen sulfide, methyl mercaptan, dimethyl sulfide, and dimethyl disulfide, are heated to a temperature of 220 to 350 F in the presence of molecular oxygen at superatmospheric pressure. Substantially complete oxidation is achieved and no odor is released from the liquor at any point. In other processes, oxidation is conducted at 160 to 180 F and dimethyl sulfide and dimethyl disulfide are essentially unaffected and released to the air.

**40357** **APTIC NO. 64855**

Morris, E. B. and J. L. Schumann

CONDITION FLYASH WITH SYNTHETIC SO3. *Power, 118(7):59-63, July 1974. 12 refs.*

The conditioning of fly ash with synthetic sulfur trioxide is discussed. It enables an electrostatic precipitator to achieve normal collection efficiencies when cleaning flue gas at temperatures within the difficult range of 240-350 F and from boilers burning low sulfur, high ash coals. The injection of minute quantities of SO3 reduces the electrical resistivity of the fly ash to values below the critical level of 10 to the 10th power ohms/cm. These SO3 quantities range from 10 to 30 ppm by volume of the flue gas. On site synthesis eliminates the need for storing or handling either sulfuric acid or liquid SO3. It is more economical than installing new hot precipitators, wet scrubbers, or special low temperature electrostatic precipitators designed for low sulfur coal. Existing plants can upgrade the collection efficiency of their electrostatic precipitators to meet new particulate codes while continuing to burn economical low sulfur coal.

**40358** **APTIC NO. 64905**

Munekata, Eiji and Kunio Akiba

DESULFURIZATION OF MINE OIL BY HOT WATER EXTRACTION. *(Nessui chushutsu ni yoru koku no datsuryu). Text in Japanese. Nenryo Kyokaishi (J. Fuel Soc. Japan (Tokyo)), 53(565):340-349, May 1974. 8 refs.*

Results are presented from tests investigating the feasibility of oil desulfurization by super-heated-water extraction. Data are given for autoclave and double autoclave tests and extraction tests in terms of extraction temperature, sulfur content of original and treated samples, and the volume ratio of water to oil. Preliminary data suggest a partition relation of 100:5 for ratio of sulfur in oil to sulfur in water at 300 C for gas oil with 0.98% S and a specific gravity of 0.83. Where 80% desulfurization is desired, 16 volumes of water are necessary for 1 volume of gas oil in a counterflow extraction system and 80 volumes of water in a parallel flow system. Improvements can be obtained by combining the recovering and concentrating processes to the extraction column system.

**40359** **APTIC NO. 63265**

Munn, R. H. E.

PAINT VERSUS POLLUTION--POSSIBILITIES FOR THE FUTURE. *Trans. Inst. Metal Finish., 52(2):73-77, June 1974. 1 ref.*

The control of atmospheric pollution from the coating industry is discussed. Legislation in the United States, particularly Rule 66 of Los Angeles County places severe restrictions on the level of aromatic hydrocarbons that can be used in a coating. There is a continuing greater awareness of the pollution problem in western Europe and the institution of tighter controls on organic emissions is probable. Three types of coating offer reduced pollution: solvent free coatings, including power coatings and the curing of organic coatings by ultra-violet light and electron beams, water based coatings, including aqueous dispersions, colloidal dispersions, and water reducible resins; and high solids coatings. The advantages and disadvantages of each type of coating are summarized.

**40360** **APTIC NO. 63288**

Mushika, Mitsuru

LOW EMISSION ENGINE AND FUEL ECONOMY. *Preprint, Automobile Technical Assoc., Tokyo, p. 253-257, 1974. Text in Japanese. (Presented at the Japan Automobile Technical Association, Lecture Meeting, Tokyo, Japan, May 1974, Paper 34.)*

Fuel economy and emission reduction from automobiles are discussed. Engine operation modifications such as carburetion do not decrease fuel efficiency, but they also cannot sufficiently decrease pollutant emissions. Ignition delay and decreases in the air-fuel ratio decrease emissions of hydrocarbons and nitrogen oxides, but fuel economy suffers. Either thermal or catalytic afterburners are appropriate control methods for engine exhausts which also preserve fuel economy.

**40361** **APTIC NO. 64711**

Mutoh, Nobuo

APPLICATION OF MICROBES TO ENVIRONMENTAL POLLUTION CONTROL. *(Kankyo hozen mondai e no biseibutsu no riyo). Text in Japanese. Yuki Gosei Kagaku Kyokai Shi (J. Soc. Org. Syn. Chem.), 32(4):328-340, April 1974.*

Bad odor created by industrial liquid waste is difficult to control, because deodorization methods applicable to bad odor are influenced by changes of liquid conditions. The decomposition conditions can be changed drastically by changes in water content of the liquid waste, changes of pH can affect odor gas emission conditions, and the effects of adsorption or ion exchange treatment can be greatly reduced by soiled water. Such methods as combustion, contact oxidation, or electrostatic precipitation, which are all effective for ordinary gas deodorization cannot be applied to odor gas from liquid. The use of neutralizer or masking agents is expensive and can cause secondary odor problems. Sulfur, hydrogen sulfide, ammonia, phenol, and other oxidizable substances can be oxidized by air or other strong oxidizing agents. In some cases, binding with metals is possible. Coagulation precipitation by organic or inorganic coagulant is also effective. Perishable organic substances can be treated by biological treatment. Activated sludge can decrease bad odor elements in both emission gas and liquid. The deodorization mechanism includes dispersion, adsorption, decomposition, and secondary reaction by formation of secondary substances. In this case, aerobic bacteria contribute to the deodorizing effects. The functions of bacteria, types of bacteria, and the limits of effectiveness are discussed for gas, water, soil, and other industrial waste.

**40362** **APTIC NO. 64513**

Naber, Jaap Erik and Johannes Everdinus Gerrit Ploeg

PROCESS FOR THE REMOVAL OF SULPHUR TRIOXIDE FROM GASES. *(Shell Internationale Research Maatschappij N.V., The Hague (Netherlands)) Brit. Pat. 1,343,456. 12p., Jan. 9, 1974. (Appl. April 22, 1971, 33 claims).*

A process for the catalytic removal of sulfur oxides as sulfur trioxide is described in which a solid acceptor is used which when loaded can be regenerated economically unlike prior art solid acceptor designs. The gas to be cleaned is contacted at a temperature above 180 C with a solid, inorganic oxide acceptor, such as activated alumina. Then acceptor is then regenerated when loaded with SO3 by contacting the loaded acceptor at an elevated temperature with hydrogen sulfide or a gas containing H2S. The regenerated acceptor is then used again for removing SO3 in another contacting step.

**40363** **APTIC NO. 63401**

Nagaishi, Isao, Kaoru Sato, Fumio Tsujimoto, Yasuo Omotehara, Yasuro Fukumura, Hiroshi Tomoto, and Tadahiro Azuma

NOX DISTRIBUTION IN OIL BURNER FLAMES. *(Abura bana ni okeru kaennai no NOx bunpu ni tsuite). Text in Japanese. Preprint, Osaka Prefectural Industrial Research Inst., p. 25-26, 1974. (Presented at the Osaka Prefectural Industrial Research Institute 1974 Study Meeting, Osaka, Japan, May 29, 1974, Paper I-13.)*

The relationship between combustion conditions and the amount of nitrogen oxides formed during combustion was studied for the purpose of developing a low NOx combustion furnace. A small vertical furnace with a 0.98 cu m capacity was used with a jet injection device for fuel oil at the speed of 21.6 l of oil every hour. The furnace has a slit for a flame monitoring probe in front, and six 100-millimeter inspection holes around the wall. The flue also has two holes for sampling probes. The internal pressure of the furnace was kept at 9.1-0.2 mm Aq, and Orsat analyzer was used to control the combustion gas composition at 13% of carbon dioxide, 3% of oxygen, and 0% of carbon monoxide. The sampling probe combined with a thermocouple thermometer had a double tube water cooling device. Checking the distribution pattern of flame temperature was a much better method for examining NOx formation than checking oxygen concentration patterns. Three isothermal maps are presented. The formation speed for NOx depended on the flame temperature, and the elimination of the high temperature area is most important for the control of NOx formation.

**40364** **APTIC NO. 64782**

Nagata, Katsuya

NOX ATTENUATION MEASURES FOR FIXED EMISSION SOURCES. *(Kotei hasseigen ni okeru NOx teigen taisaku). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 3(7):73-82, July 1974. 8 refs.*

There are two sources of nitrogen oxides, thermal NOx resulting from high temperature combustion of N2 and O2, and fuel NOx from nitrogen content in fuel. Fuel NOx contributes a considerable portion to the total NOx in the environment. The NOx can be controlled by improving combustion techniques and by denitrogenation of fuel. The improvement of combustion techniques includes operating conditions such as air/fuel ratio, mixing characteristics in combustion chamber, thermal loading of combustion chamber an/ preheating of combustion air, and combustion methods such as low NOx burner, two-stage combustion, flue gas recycling, off-stoichiometric combustion, and steam spraying. Denitrogenation includes dry methods such as catalytic decomposition, catalytic reduction, adsorption, absorption by melt salt, and polymerization, and wet methods such as absorption by liquid solution, oxidation-absorption, reduction, and formation of complex. Precautions must be taken against any possible secondary pollution when denitrogenation is employed.

**40365** **APTIC NO. 64678**

Nakagawa, Shikazo

REMOVAL OF NITROGEN OXIDES BY DECOMPOSITION. *(Sankachisso no bunkai jokyo). Text in Japanese. Sekiyu Gakkai shi (J. Japan Petroleum Inst.) (Tokyo), 17(5):392-396, May 1974. 7 refs.*

Denitration achieved by reduction and decomposition of nitrogen oxides using a solution of the sulfite of sodium in water is discussed. The two-stage method utilizes a TOPCA-M type decomposition tower composed of two vertically connected cylinders into which flue gas containing nitrogen oxides is introduced at the lower stage, the solution of sulfite is supplied from the inlet at the upper stage and transferred through an overflow tube from the upper stage to the lower stage, and the gas is contacted with the sulfur trioxide-rich decomposition liquid so that the nitrogen monoxide molecule is rapidly reduced and decomposed. Although there are great differences in the decomposition rate of nitrogen monoxide using different forms of alkalies, ammonia, and alkaline earth metals, nitrogen dioxide is almost completely decomposed by any solution and slurry sulfite, and the decomposition rate does not vary with the type of gas-liquid contacting equipment. Nitrogen monoxide present in flue gas may therefore be concentrated at the outlet of the sulfur dioxide absorption tower and be oxidized to nitrogen dioxide. This is introduced into an absorption tower in which the solution of sulfite is circulating for reductive decomposition, and the nitrogen dioxide obtained can form nitric acid and nitrate.

**40366** **APTIC NO. 64896**

Nakamota, Mitsuyuki, Yoshioki Shingo, Mamoru Takeuchi, and Masaru Ogawa

METHOD FOR MANUFACTURING OXIDATION CATALYST FOR CARBON MONOXIDE AND HYDROCARBONS OF INTERNAL COMBUSTION ENGINE EXHAUST GAS. *(Nainen kikan haiki gasuchu no issanka tanso oyobi (matawa) tanka suiso no sanka shokubai o seizo suru hoho). Text in Japanese. (Fujikura Densen K. K. (Japan)) Japan. Pat. Sho 49-23112. 3p., June 13, 1974. (Appl. Dec. 30, 1970, 1 claim).*

The production method for oxidation catalysts resistant to poisoning by lead or lead compounds, thermal deformation and fusion, and effective for the removal of carbon monoxide and hydrocarbons contained in internal combustion engine exhaust gas is described. An air laid web made of fine wires of heat resisting alloy containing iron as a base and more than one type of nickel or chromium compounds is used. On a layer of air laid web, a copper oxide, copper or nickel halide, and a mixture of flake and powder graphite are placed and covered with another layer of air laid web. This preparation is heated at 750 C in a non-oxidative atmosphere, producing fibrous metal of copper or copper and nickel and a composite of metal consisting of copper or copper and nickel and graphite closely adhered between two layers of air laid webs. The heated preparation is cooled in a non-oxidative atmosphere, followed by a thermal treatment in the presence of oxygen. The ratio of fibrous metal and composite of metal and graphite is varied according to the purpose of treatment of exhaust gas. The catalyst prepared in this manner has a structure of metallic web with superior thermal resistance and gas permeability combined with fibrous metals with high catalytic activity, which is sufficiently durable as the oxidation catalyst for internal combustion engines. Removal rates of 99% for CO and 70-90% for methane are obtained.

***40367*** ***APTIC NO. 64791***

*Nakamura, Toshio*

*A COMBUSTOR. (Nensho sochi). Text in Japanese. (Ebara Infilco K. K. (Japan)) Japan. Pat. Sho 49-17712. 3p., May 2, 1974. (Appl. Aug. 1, 1970, 1 claim).*

A combustor for deodorization of malodorous gases consisting of hydrogen sulfide, ammonia, and organic compounds produced in the night soil treatment process is described. Two fuel supply nozzles, one placed inside of the outer nozzle, are attached to the combustion chamber. The fuel flow in two nozzles is connected by holes made on the inner nozzle. The lower part of the outer nozzle is made flexible so that it can be expanded or contracted depending on the quantity of effluent gas to be combustion deodorized or the quantity of fuel gas. The desulfurized digestive gas is used as a fuel. The effluent gas is led into the combustion chamber as primary air by blower and simultaneously the digestive gas injected from nozzles is ignited while the secondary air is led into the chamber through the air intake port located at the lower part of the combustion chamber. The organic gaseous compounds are heated to 450-750 C and completely decomposed and deodorized. Since the system can be adjusted according to the flow rates of effluent gas and fuel, the combustion can be carried out continuously and efficiently without cumbersome operations such as the switching of multi-numbered burners in the existing combustor. The combustor is structurally simple and economical. It can be attached to vacuum cars and operated with propane gas as fuel for combustion deodorization during the operation of vacuum cars.

**40368** **APTIC NO. 63136**

Nakashima, Tsuneo, Ryo Araki, Noboru Kakiuchi, and Toshihiro Ikeda

ON THE DUST COLLECTING SYSTEM IN THE ELECTRIC ARC FURNACE MELTING AND MG TREATMENT. *(Akuro kenoku shujin to teishuharo ni okeru Mg shoriji baijin no kyoyo shujin sochi ni tsuite). Text in Japanese. Imono (Foundry), 46(4):75-76, April 1974. 1 ref.*

The manganese dust-containing smoke from the arc furnace and a low cycle induction furnace at a foundry was successfully controlled by an airtight building enclosure and filter bag dust collector. The smoke is collected by side hoods and air curtain and is retained briefly at an airtight enclosed room at the top of the building. According to a mathematical calculation, the amount of smoke emitted at the time of steel production is 6930 cu m. The building is low, and if the smoke is kept for more than three minutes, the smoke will back down and fill the workshop. Therefore, the treatment air quantity was designed at 2610 cu m/min, with a 15% room, and a total capacity of 300 cu m/min. The room capacity is 2430 cu m. The dust collection rate by actual measurement for the arc furnace is 98.2% and 99.8% for the manganese processing. The dust concentration at the exit of the dust collector is 0.0011 g/N cu m.

**40369** **APTIC NO. 64898**

Nerihaya, Fumio and Tsugita Yukitake

EXHAUST GAS CLEANSING METHOD AND DEVICE. *(Hai gasu joka hoho oyobi shochi). Text in Japanese. (Hitachi Co. (Japan)) Japan. Pat. Sho 49-24342. 5p., June 21, 1974. (Appl. Dec. 4, 1970, 2 claims).*

A cleansing method and device for exhaust gas containing sulfur dioxide, nitrogen dioxide, nitric oxide, hydrogen sulfide, sulfur, hydrogen fluoride, and fluorine based on the chemical reaction with substances such as sodium hydroxide are described. In the vaporization tower, the exhaust gas is mixed with a spray mist of reaction solution, the toxic gases absorbed into the reaction solution undergo reactions, and the reaction products are solidified by the evaporation of water with heat retained in exhaust gas and recovered as solid particles. In the device of this invention, the vaporization tower with exhaust gas inlet located at the top and outlet located on the lower side wall is equipped with spray nozzles for supplying reaction solution mist located at the upper part of the tower. The detector device for measuring the toxic gas concentrations at the inlet of the tower and the supply system of reaction solution, in which the ratio of water and reactant is adjusted depending on the toxic gas concentration by means of the electrical signal from the detector, are connected to the vaporization tower. The supply of reaction solution is regulated so that the temperature in the vaporization tower would be maintained above the dew point by monitoring the temperature and humidity at the exhaust gas outlet of the tower. The exhaust gas containing solidified reaction products is led into a cyclone, separated, and recovered. A part of the solidified reaction product is led out of the tower through the outlet pipe with rotary valve or double air lock damper located at the bottom of the tower.

**40370** **APTIC NO. 63192**

Nguyen, X. and J. M. Beeckmans

SONICALLY ENHANCED DEPTH FILTRATION OF AEROSOLS. *J. Aerosol Sci., 5(2):133-143, March 1974. 12 refs.*

The efficiency of depth filtration of aerosols is enhanced in the presence of sound in the low sonic frequency range. A number of parameters were investigated, including sound intensity, sound frequency, face velocity through the filter, and aerosol particle size, using monosized uranine-methylene blue aerosol particles deposited on a commercial fibrous filter. In the particle size range 0.65-1.75 micron, efficiency increased with particle size, whereas an increase in the face velocity through the filter resulted in a decreasing effect due to sound. It is postulated that the enhancement in deposition efficiency was due to increased inertial impaction and interception caused by sound-induced vibration of the aerosol particles and to an increase in particle diffusivity due to acoustically induced turbulence. A theory of acoustically-enhanced aerosol filtration is presented which is in good agreement with the data. (Author abstract)

**40371** **APTIC NO. 64614**

Nilsson, Dan Leo

IMPROVEMENTS IN OR RELATING TO MOTOR VEHICLE FUEL SYSTEMS. *(Saab-Scania Aktiebolag, Linkoping, Sweden) Brit. Pat. 1,353,640. 5p., May 22, 1974. (Appl. July 14, 1971, 7 claims).*

This invention aims to prevent fuel vapors from escaping to the surrounding air when, for example, a vehicle is parked. Instead, in a motor vehicle having an assembly embodying the invention, the vapors are accumulated in the vehicle and, when the engine is running, are sucked into the engine and burned. It comprises a fuel tank, a filling tube connected to the fuel tank that is sealable by a tank cap, and a vent line comprising separate first and second portions. The first has an end opening to the fuel tank and another end opening into the filling tube adjacent to the tank cap, with the second portion having one end opening into the filling tube adjacent to the tank cap and another end connected to a filtering means, the other end of the first portion being controlled by a valve, closed by removal of the tank cap and opened by mounting of the cap, whereby when the assembly is installed in a motor vehicle with the filtering means connected to the vehicle engine s air intake system the filtering means will accumulate and filter fuel vapors coming from the fuel tank.

**40372** **APTIC NO. 64901**

Okubo Shigeyuki

THE SMOKE ODOR REMOVAL DEVICE. *(Enshu jokyo sochi). Text in Japanese. (Assignee not given.) Japan. Pat. Sho 49-17710. 2p., May 2, 1974. (Appl. Aug. 18, 1970, 1 claim).*

A smoke odor removal device for odor sources (such as refuse incinerators and combustion systems) which can be operated with less power than existing devices is described. The nozzle area of a hydraulic pump is connected to the outlet for odorous smoke. The inlet of the hydraulic pump nozzle is connected to the outlet of the liquid pump and the outlet of the hydraulic pump nozzle is connected to the inlet of the liquid pump so that the water circulates. The water ejected from the hydraulic pump nozzle reduces the pressure at the nozzle area and thereby sucks in the smoke from the odorous smoke outlet. The water containing odorous smoke travels through a pipe with many slits which are open to the separatory tank containing water and an activated charcoal filter layer placed over the water layer. The odorous smoke contained in the water is emitted through slits and separated into gaseous and solid portions. The water, after removal of odorous smoke, is led to the inlet of the liquid pump where it is pressurized and circulated back to the hydraulic pump. Since the water ejected by the hydraulic pump is fed into the liquid pump, the residual energy imparted by the hydraulic pump is used by the liquid pump, thereby reducing the energy required for operation of the liquid pump.

**40373** **APTIC NO. 63200**

Oshchepkov, N. T. and V. I. Skryl

CONTROLLING THE SULFUR DIOXIDE CONCENTRATION IN TOWER ACID PRODUCTION. *(Regulirovaniye kontsentratsii SO2 pri proizvodstve bashennoy kisloty). Text in Russian. Bumazhn. Prom. (Moscow), no. 1:21-22, Jan. 1974.*

An automatic control system for controlling the sulfur dioxide concentration in tower acid production was developed by computerized processing of the functions obtained for the parameters involved. The automatic control system, of cascade type, is composed of two internal control circuits for gas outlet temperature control, and another external control circuit for SO2 concentration control. Such automatic control systems are necessary due to the use of aqueous solutions from scrubbers which results in variations in the SO2 concentrations admitted to the absorption towers.

**40374** **APTIC NO. 64790**

Oshima, Goro and Michio Aoyama

AN ELECTRIC CHARGE APPARATUS FOR PARTICLES. *(Ryushi kaden sochi). Text in Japanese. (Yasukawa Electric Appliances Co., Ltd. (Japan)) Japan. Pat. Sho 49-19303. 5p., May 16, 1974. (Appl. Oct. 6, 1970, 1 claim).*

An electric charge apparatus for uniform charging of powder particles and liquid particles used in the dust collector or electrostatic coating process is described. The final charge the distance between particles decreases. In order to impart uniformly higher chages to all particles, it is necessary to stir up the particles in the ionic space by some means. Also, the charged particles tend to gravitate toward the electrode facing the needle-shaped electrode and are absorbed onto the electrode. This tendency is more prominent with particles with higher charges. In the apparatus of this invention consisting of a needle-shaped electrode and a plate, circular, or cylindrical electrode, numerous small holes are made on the surface of the electrode facing the needle-shaped electrode, through which the high pressure gas is injected. By this gaseous flow, the particles approaching the electrode facing the needle-shaped electrode are diverted, thereby preventing the adsorption, and simultaneously the particles in the ionic space are stirred up. In the case of a cylindrical electrode, the gas is injected so that it forms a vortex flow to assure the prevention of particle adsorption to the electrode.

**40375** **APTIC NO. 64605**

Panzarella, John Edward

RECOVERY OF CHEMICALS FROM WASTE GASES. *(Dow Chemical Co., Midland, Mich.) Brit. Pat. 1,348,337. 3p., March 13, 1974. (Appl. April 26, 1971, 10 claims).*

A process is described for removing condensible pollutants from a waste gas stream which comprises bringing the waste gas into contact with the surface of a condenser maintained at a temperature of 0 C, or below to condense vapor from the gas and vent the noncondensible gas to the atmosphere. Ice formation in the condenser is prevented by supplying a water-miscible, ice-preventing liquid flow over the condenser surface. The latter principle formed the basis for the discovery of this improved process. This process is generally used only when the temperature of the zone is maintained below 0 C. The pressure is not critical and the process operates equally well at atmospheric, subatmospheric, and superatmospheric pressures, although operating under a high vacuum or a high pressure increases the cost of operating and the capital expenditures.

**40376** **APTIC NO. 64792**

Parkash, Sat

THE CHEMISTRY OF ACTIVATED CARBON. *Chem. Ind. (London), no. 11:445-449, June 1, 1974. 50 refs.*

Currently about 7 million tons of activated carbon are consumed annually in Canada, and the consumption is expected to increase. In view of developing industrial interest in activated carbons and related solids as pollution control media, the chemistry of activated carbons is receiving renewed attention. The chemistry of activated carbon, its definition, the raw materials and preparation process, the mechanism of the activation processes, the chemical bonding and functional groups, the surface area and pore size distribution, and the factors governing adsorptive properties are discussed.

**40377** **APTIC NO. 64798**

Patterson, W. D.

PROGRESS IN SATISFYING ENVIRONMENTAL REQUIREMENTS. *Public Util. Fortn., 94(3):13-27, Aug. 1, 1974.*

Since the National Environmental Policy Act was passed in 1969, significant progress in satisfying environmental requirements has been made. Air, water, and land pollution legislation has been enacted, and enforcement procedures have been developed. Land use legislation is now under consideration. Emission and air quality standards have been passed covering various industries and pollutants. Advances have been made in pollution abatement techniques, and more money is being spent on air pollution control. The utilities industry is spending constantly increasing amounts on air and water pollution abatement from steam and nuclear plants. These various legislative and economic aspects of pollution control are discussed with emphasis on pollution control in the utilities industry.

**40378** **APTIC NO. 64510**

Perga, Martin Wendel and Ted Vernon Depalma

METHOD AND APPARATUS FOR TREATING I.C. ENGINE EXHAUST GAS. *(Universal Oil Products Co., Des Plaines, Ill.) Brit. Pat. 1,351,341. 6p., April 24, 1974. (Appl. June 28, 1971, 9 claims).*

A catalytic oxidation method for reduction of unburned hydrocarbons and carbon monoxide in automotive exhausts is described which precludes the deposition of undesirable material on the catalyst. The converter consists of a gas inlet, a catalyst-retaining section, and a gas outlet. A portion of the exhaust gas is passed through a carbon zone, with the proportion of gas depending on converter temperature. Partial oxidation of the carbon and dissociation of the water present in the exhaust gases produces hydrogen and carbon monoxide. The total exhaust gas stream, including any CO or H2 produced in the carbon zone, is then passed through the catalytic conversion zone for oxidation to a treated state. The addition and subsequent oxidation of H2 and CO increases conversion zone temperature to sustain the combustion of the undesirable material without separate ignition means.

**40379** **APTIC NO. 64489**

Peter, Armin

THE PROCESS OF INTERMEDIATE ABSORPTION FOR CONTACT SULFURIC ACID. *(Ueber das Verfahren der Zwischenabsorption fuer Kontaktschwefelsaeuere). Text in German. Chem. Tech.(Berlin), 26(5):282-285, May 1974. 8 refs.*

For the reduction of sulfur dioxide emissions from sulfuric acid three methods are available: top-maintenance of the plant, application of intermediate absorption, and end gas cleaning by absorption and adsorption. After preliminary conversion of the sulfur dioxide by 90%, the sulfur trioxide which forms in this process is absorbed in a separate absorption tower. The remaining gas is again oxidized after it has been heated up. A total conversion of 99.7% can be achieved by this approach and the SO2 emission is reduced from 2000 ppm to less than 500 ppm. The theoretical fundamentals concerning chemical equilibrium of SO3 intermediate absorption are based on the law of mass action. An investigation of the influence of the reaction speed of intermediate absorption on the reaction speed of the conversion shows that the reaction speed drops by nearly two decimal powers with increasing SO3 concentration. An intermediate absorption brings the reaction as close to equilibrium as possible. The costs for erection of a plant operating with intermediate absorption are no higher than for a conventional

**40380** **APTIC NO. 64820**

Phelps, Peter M.

COMBINATION GAS STRIPPER AND COOLING TOWER. *(Assignee not given.) U. S. Pat. 3,785,121. 5p., Jan. 15, 1974. 7 refs. (Appl. March 27, 1972, 13 claims).*

A method and apparatus is described for simultaneously stripping a liquid stream contaminated with a dissolved gas impurity in a stripping section and cooling a fluid (liquid or gas) in a fluid cooling section. The stripping efficiency is increased by supplying an air stream for stripping which has been warned by heat transfer with the cooled fluid in the fluid cooling section. In one embodiment, one or more fluid cooling sections of a crossflow type are disposed below and to the sides of an upright stripping section so that a fan can draw air sequentially through both sections. In another embodiment, fluid cooling sections of crossflow type are disposed at the sides of the stripping section at the same elevation. For economy, the cooled fluid exiting from the liquid cooling section may be directed past a heat generating source for cooling the same and thereafter recycling to the fluid cooling zone. (Author abstract)

**40381** **APTIC NO. 64691**

Pike, Daniel E.

GAS COLLECTOR FOR STEEL FURNACE. *(Air Pollution Industries, Inc., Englewood, N. J.) U. S. Pat. 3,785,630. 6p., Jan. 15, 1974. 4 refs. (Appl. Sept. 18, 1972, 2 claims).*

A method and apparatus for collecting gases formed during operation of a steel furnace are described. A negative static pressure is maintained in the collected gases in the stack by proportioning the stack or by placing an orifice in the bottom of the stack. In conventional apparatus, no account is taken of the stack effect. The stack pressure of the collected gases, which may initially have had a negative value in the hood, increases and acquires a positive value in the stack and the gases thus tend to leak out into the atmosphere through the joints between adjacent panels. This creates undesirable and intolerable conditions in the working areas adjacent to the converter or furnace. As the temperature of the off gases may run 4500 F, the cooling water requirements of a typical basic oxygen furnace hood and stack lie in the range of 600 to 12,000 gal/min. (Author summary modified)

**40382** **APTIC NO. 64689**

Polsak, Edwin Mark and Donald Joseph Kalfas

COMBUSTION CHAMBER INCLUDING DRY AND WET COLLECTION OF PARTICULATE MATTER. *(Combustion Engineering Inc., Windsor, Conn.) U. S. Pat. 3,788,244. 4p., Jan. 29, 1974. 3 refs. (Appl. Dec. 20, 1972, 4 claims).*

A compact, economical incinerator is described which includes a chamber for the dry and wet collection of particulate matter. Since a major part of the solids are removed prior to wet scrubbing, the problem of cleaning the scrubber water common to other incinerators is greatly reduced. The incinerator has a cylindrical upper portion and a lower frustoconical portion. The combustibles are tangentially introduced into the upper portion of the incinerator, thereby increasing their residence time within the incinerator. Fly ash and other large solids centrifugally separated from the combustion gases are removed through a lower outlet. An upper outlet duct positioned within the cylindrical portion of the combustion chamber contains a plurality of water sprays and baffles for precooling and wet scrubbing the gases, thus removing the fines before the gases are discharged to the atmosphere. (Author summary modified)

**40383** **APTIC NO. 64603**

Pouit, Robert Jean

METHOD AND DEVICE FOR SUPERCHARGING FOUR-STROKE INTERNAL COMBUSTION ENGINES. *(Assignee not given.) Brit. Pat. 1,354,099. 6p., May 22, 1974. (Appl. July 5, 1971, 12 claims).*

A supercharging method for multicylinder internal combustion engines operating on a four-stroke cycle is described, characterized by the depression which exists at the exhaust port of one of the cylinders following the initial discharge of exhaust gas being made to act at the intake port of a second cylinder out of phase with respect to the first by a half-cycle period. The invention not only increases the power and efficiency of the engine, but produces exhaust gases practically free of carbon monoxide. The aim of the invention is to increase the power and efficiency of multi-cylinder four-stroke engines by using the depression created by the initial discharge of exhaust gas to ensure the supercharging of these engines. Up until now, there has not been a way of using the depression created by the initial high-velocity discharge in order to supercharge the engines.

**40384** **APTIC NO. 64878**

Prakash, C. B., K. B. Mathur, and F. E. Murray

ODOUR CONTROL FROM A KRAFT MILL LIME KILN USING A SPOUTED BED PRE-DRIER. *Can. J. Chem. Eng., 52(2):196-200, April 1974. 10 refs. (Presented at the American Institue of Chemical Engineers and Canadian Society of Chemical Engineers, Joint Conference, 4th, International Symposium on Spouted Beds, Vancouver, British Columbia, Sept. 9-12, 1973.)*

A study was conducted on the drying of lime mud and the concurrent oxidation of sodium sulfide in the mud. The experiments were done using a 6 in. diameter spouted bed of coarse inert particles (cement clinker and limestone; -4 + 10 mesh) with continuous feed of lime mud. A range of inlet gas temperatures, from 260 to 400 F, was studied. A high degree of sulfide oxidation was achieved by this method over the entire temperature range, sulfide removal being in excess of 80% in all runs and as high as 98% in some. An analysis of the economic feasibility of drying lime mud in a spouted bed indicated that the process has good potential both as a method for drying lime mud prior to calcining and for control of hydrogen sulfide emissions from lime kilns operated at kraft pulp mills. (Author abstract)

**40385** **APTIC NO. 64457**

Roots, D. C.

THE ELIMINATION OF ATMOSPHERIC POLLUTION FROM STOVING OVENS. *Ind. Finish. Surf. Coatings, 26(312):4-5, June 1974.*

During large-scale impregnating, painting, and coating operations, ovens are used for drying and curing which discharge hydrocarbon air contaminants. Because of emission regulations, scrubbers, absorption, or incineration are used to control these emissions. Three incinerator systems currently used are discussed, each having different combinations of heat recovery apparatus tailored to the specific needs of the process. System one is used for ovens in which aluminum foil is painted or coated. Solvent fumes are sent through an incinerator through a preheater to increase temperature. System two is used in the manufacture of electrical insulating materials. The exhaust air containing HC solvents and resin droplets is sent to the incinerator through a preheater using heat exchanged from the outgoing flue gases. Further heat recovery is effected using a heat transfer fluid in a specially designed heat exchanger. System three is used by motor car manufacturing industries using paint and drying equipment. Solvent and pigments in the exhaust fume are removed by incineration after the fume enters a preheater. The flue gas is cleaned and is suitable for recycling directly to the oven where the heat is used to the greatest possible extent. This has lower capital cost and marginally lower running cost than the other systems.

**40386** **APTIC NO. 64889**

Saeki, Shinzo, Keigo Umeda, Shunji Unoki, Hikaru Shikayama, and Heisuke Nakagawa

EXPERIMENTS ON THE REMOVAL OF MONO-TERPENE GROUP ODOR ELEMENTS. *(Mono terupen-kei shuki seibun no jokyo ni kansuru shikenteki kenkyu). Text in Japanese. Yosui To Haisu (J. Water Waste), 16(7):45-51, July 1974. 7 refs.*

Ozone and activated charcoal were used to deodorize sample water and waste water containing monoterpenes. A mixture of 1 g of alpha-pinene, beta-pinene, camphene, limonene, and cymene was dissolved in a small amount of acetone and the solution was shaken vigorously with 5 l of distilled water for 5 min. The mixture was allowed to stand overnight and undissolved solids were filtered. It was then diluted to prepared sample waters with odor concentration of 2000 OT, 1000 OT, and 500 OT. Treatment with activated charcoal was done by filtering through a 20 cm column containing 440 cu m of charcoal (8 to 32 mesh, density equals 0.477) at a rate of 300 ml/min. Treatment with ozone was carried out by gas dispersion method. Samples and treated water were analyzed for pH, COD (chemical oxygen demand) and TO as well as by gas chromatography with a 2 m long Carbowax 20 M column and a flame ionization detector. For ten minutes treatment at an O3 supply rate of 20 mg/l, more than 90% of the odor from TO 4500 sample water was removed. The rate of removal decreased as the original concentration decreased. It was only 76% for TO 500 sample water. An industrial waste water having an odor concentration of 6000 was successfully treated with 120 mg/l of 03 for 120 min (95.8% removal) or with activated charcoal at 200 m/day (100% removal).

**40387** **APTIC NO. 63137**

Sakai, Katsumasa and Hirotoshi Okubo

ENVIRONMENTAL IMPROVEMENT INSIDE THE TOLL-WAY GATES. *(Yuryo doro ryokinsho nai no kankyo kaizen). Text in Japanese. Mitsubishi Denki Giho (Tokyo), 48(4):465-469, April 1974.*

The air of toll booths for major highways could be improved by installing aircurtains, dutch doors, blowers, dispersion sirocco fans, and air conditioning. Using this equipment, the air balance can be adjusted in combination with a heater or a cooler and a more comfortable environment can be created. The effectiveness of the equipment was examined and data were compared, and clear improvements were noted. In a booth with an air curtain, heater, air conditioning, a dutch door, ventilation suction, and air dispersion fan, measurements of carbon monoxide and dusts were taken at various points and levels. At the level of the booth attendant's face, the dust level decreased from 0.08 mg/cu m to 0.03 mg/cu m, and CO decreased from about 11 ppm to 8 ppm. The most effectively reduced area was the center of the booth at the height of 1.5 m, where the dust concentration was reduced from 0.09 mg/cu m to 0.04 mg, and CO was reduced from 12 ppm to 7 ppm. When the air conditioning and fan were operated, the CO concentration was reduced 100% in three minutes.

**40388** **APTIC NO. 64769**

Schenker, Barry A., Irving Malkin, and Kirman Taylor

CATALYST FOR OXIDATION OF HYDROCARBONS AND CARBON MONOXIDE. *(Diamond Shamrock Corp., Cleveland, Ohio) U. S. Pat. 3,789,022. 4p., Jan. 29, 1974. 7 refs. (Appl. Aug. 19, 1971, 3 claims).*

This invention relates to an improved catalyst for treatment of exhaust gases from internal combustion engines to remove noxious components (carbon monoxide and hydrocarbons), to a process for preparing the improved catalyst, and to a process for using the catalyst in catalytic purification of exhaust gases from internal combustion engines. The catalyst is prepared by depositing on an alumina support layers of oxides of copper, cerium, and chromium. Enhanced catalyst activity is obtained when cerium oxide is applied as the middle layer. Catalytic activity is further enhanced by applying the copper oxide layer first and maintaining the molar ratio of Cu to Cr greater than one. (Author abstract modified)

**40389** **APTIC NO. 63113**

Schiele, Carl A., Stephen F. DeNagel, and James E. Bennethum

DESIGN AND DEVELOPMENT OF A VARIABLE VALVE TIMING (VVT) CAMSHAFT. *Preprint, Society of Automotive Engineers, Inc., New York, 11p., 1974. 6 refs. (Presented at the Society of Automotive Engineers. Automotive Engineering Congress, Detroit, Mich., Feb. 25-March 1, 1974, Paper 740102.)*

The development of a variable valve timing (VVT) camshaft was initiated as a potential means of controlling exhaust emissions from a spark ignition piston engine. This approach was based on the fact that valve overlap influences internal exhaust gas recirculation (EGR) which in turn affects spark ignition engine emissions and performance. The design, fabrication, bench tests, and engine durability tests of a unit incorporating splines to allow the intake cams to move relative to the exhaust cams is discussed. The camshaft has acceptable durability and controlling the EGR with intake valve timing may be an effective means of reducing nitrogen oxides emissions. The rich 13:1 air fuel ratio, partially responsible for these low NOx values, also accounts for the relatively high hydrocarbon and carbon monoxide levels. (Author abstract modified)

**40390** **APTIC NO. 64737**

Schmidt, Peter Juergen and Harald Kizler

METHOD AND APPARATUS TO REDUCE NOXIOUS COMPONENTS IN THE EXHAUST GASES OF INTERNAL COMBUSTION ENGINES. *(Robert Bosch GmbH, Gerlingen-Schillerhohe (Germany)) U. S. Pat. 3,782,347. 8p., Jan. 1, 1974. 8 refs. (Appl. June 2, 1972, 13 claims).*

This invention provides apparatus and a method to reduce noxious components in the exhaust gases of internal combustion engines and to control the ratio of the mass of the air-fuel mixture applied to the internal combustion engine, that is, to control the air number lambda, by sensing the components of the exhaust gases and then controlling an integrating controller from the sensed signal. The signal is applied to a threshold detector, which triggers whenever the sensed signal passes a certain threshold value. The trigger signal controls an integrating controller to begin integrating, the controller providing an output signal which is applied to set the air-fuel ratio such that the air number lambda is constantly controlled to be about one. If integration by the controller persists for a period of time in excess of a predetermined lapsed time, as determined by a pulse source controlled by engine speed, the integrating rate of the controller is changed to provide for more rapid response when large changes have to be compensated for. (Author abstract)

**40391** **APTIC NO. 64664**

Schwab, Georg-Maria, Prodromos Bekiaroglou, and Michael Muecke

STUDIES ON THE INCREASE OF THE EFFICIENCY OF AFTERBURNER CATALYSTS. *PART II. (Untersuchungen zur Ausweitung der Wirksamkeit von Nachverbrennungskatalysatoren, Teil II). Text in German. Chem. Ing. Tech., 46(11):483-485, June 1974. 1 ref.*

Simple test stand trials of a twin-chamber catalytic exhaust purification device using a copper-manganese-thorium-potassium oxide catalyst on different supports are described. The tests were conducted directly with automobile exhaust under conditions close to those occurring in practice. On silicic acid as a carrier, the catalyst had a starting temperature of about 200 C, but had relatively short life. Of all carrier materials tested, such as silicic acid, alpha-alumina, zirconium, and gamma-alumina, the latter was the best, providing a start-up temperature of 110 C and a life of over 100 hr corresponding to over 10,000 km. This catalyst is applicable for leaded gasoline, and is promising in the reduction of nitrogen oxides along with the efficient oxidation of carbon monoxide.

**40392** **APTIC NO. 64476**

Schwartz, William H., and Billy D. Maxwell

INCINERATOR TYPE ENVIRONMENTAL CONTROL SYSTEM. *(Assignee not given.) U. S. Pat. 3,786,767. 6p., Jan. 22, 1974. 10 refs. (Appl. April 5, 1972, 7 claims).*

This invention is directed to an improved relatively small compact incinerator for both residential and commercial use which effectively removes all of the combustible products of the exhaust gases resulting from incineration so that it ultimately discharges exhaust gases into the atmosphere which are smokeless, odorless, and free of fly ash. The system contemplated by the invention comprises a first burning chamber of relatively large volume wherein waste products are incinerated. All of the combustion products resulting from the incineration are forced into a second relatively smaller, elongated, cylindrical burning chamber located adjacent the first burning chamber which includes means for providing a flame axially through such that all of the combustion products must pass through the flame in the second burner. A mixing nozzle is affixed to the output end of the second burning chamber for providing a vortex or swirling output of exhaust gases which are then fed through a balanced flow temperature reduction means including many tortuous passages and then to a scrubbing means to an exit flue. The dimensions of the power burner stage, the temperature reduction means, and the scrubbing means are constrained to provide a constant volumetric flow providing a substantially pollution free exit gas in the atmosphere. (Author summary modified)

**40393** **APTIC NO. 64687**

Shimizu, Hiroshi

ROTARY PISTON ENGINE WITH EXHAUST RECIRCULATING DEVICE. *(Toyo Kogyo Co., Ltd., Hiroshima-ken (Japan)) U. S. Pat. 3,783,839. 10p., Jan. 8, 1974. 3 refs. (Appl. Dec. 16, 1971, 23 claims).*

A rotary piston internal combustion engine is described with an exhaust recirculating device to reduce nitrogen oxides and noxious unburned compounds present in the automobile exhaust. The engine power output is improved with efficient fuel consumption by recirculating a portion of the exhaust gas from the engine working chamber under the power stroke to the engine working chamber under the compression stroke in response to the rotation of the power output shaft. This engine incorporates several improvements over other internal combustion engines: the fuel-air mixture is uniformly distributed so that the combustion efficiency and power output of the engine is improved without consuming as much of the mixture as was previously necessary; the nitrogen oxides are reduced to a greater extent; a reduction of the volumetric efficiency can be eliminated to improve the power output of the engine; and the device can be manufactured at low cost and can be installed in the conventional engine of this kind. (Author abstract modified)

**40394** **APTIC NO. 64837**

Shumaker, Willis L.

ACID GAS BURNER. *(Standard Oil Co., Chicago, Ill.) U. S. Pat. 3,782,884. 8p., Jan. 1, 1974. 6 refs. (Appl. May 9, 1972, 9 claims.)*

This invention relates to an acid gas burner for a thermal reactor of a sulfur plant, i.e., a plant for the recovery of sulfur from hydrogen sulfide. It contains a gas-feeding tube having a forward flared end that extends horizontally through a wall of the reactor into the chamber, and a gas diverter concentrically disposed in that open end to provide an annular space between the diverter and the flared open end of the tube. The diverter has a rearward portion with a frustoconical surface facing the inner surface of that flared end of the tube. The diverter is connected at its rear end, inside the tube, to one end of a shaft that extends rearwardly through the tube to an external location for its other end. The shaft adjacent that other end is connected to means to move the shaft longitudinally for adjustment of the dimension of the annular space between the diverter and the flared end of the tube. The burner further includes an intermediate support for the movable shaft. The intermediate support is mounted on the tube adjacent its flared end. The shaft is also supported adjacent its other end. In the prior art, the burners do not permit compensation for variations in flow of acid gas to provide a uniform flame pattern in the combustion chamber. (Author abstract modified)

**40395** **APTIC NO. 64736**

Sigal, Isaak Yakovlevich, Georgy Fedorovich Naidenov, Nikolai Alexdandrovich Gurevich, July Iosofovich Danilevich, Andrei Matveevich Shiman, Viktor Fedorovich Shishkin, and Nikolai Ivanovich Goncharenko

METHOD OF THERMAL PURIFICATION OF WASTE NOT FORMING A BURNING MIXTURE WITH FUEL OR AIR SEPARATELY. *(Assignee not given.) U. S. Pat. 3,782,302. 3p., Jan. 1, 1974. 5 refs. (Appl. Oct. 12, 1972, 5 claims).*

A method is presented for purification of waste gases in various industrial enterprises from impurities, mainly organic ones. The method can be used for purifying the waste gases generated in the production of synthetic fat substitutes, dyestuffs, antibiotics, synthetic fibers and other products of organic synthesis and for purifying the waste gases liberated in the process of oil refining, drying of coatings, and smoking. The method consists of burning the waste gases in the furnaces of boiler units including those whose main function is generation of thermal and electrical energy. The waste gases to be purified are delivered under, or into the beginning of, the fuel burning zone instead of part or all of the air required for the combustion of the fuel. The main disadvantage of the prior art involved a considerable consumption of heat energy for heating the waste gases to 800 C and above, and a low degree of purification of waste gases.

**40396** **APTIC NO. 64456**

Sommers, H.

OPERATING EXPERIENCES WITH THE LURGI RUHRGAS METHOD FOR PRELIMINARY DEGASING OF

COAL COMBINED WITH A BOILER. *(Betriebserfahrungen mit dem LR-Verfahren zur Vorentgasung von Kohle in Verbindung mit einer Kesselfeuerung). Text in German. VGB Kraftwerkstechnik, 54(5):306-310, 1974.*

The Lurgi Ruhrgas preliminary degasing unit operates with circulating hot, fine-grained degasing coke which supplies the necessary heat for preliminary degasing. The system comprises mainly a degasing shaft where the entering dry coal is degased by means of the circulating coke, a transport and warm-up path where the coke, cooled in the degasing shaft to 920 C, is re-heated to 990 C and transported upward, as well as a bunker which sifts the heated coke, and returns the coarse fraction to the degasing shaft. The very fine-grained fraction of the coke with the developed waste gases, which also contain combustible gas components, is injected into the connected boiler. Experiments have shown that the coke sent to the cyclone firing system of the boiler with the hot flue gases burns more completely in shorter and hotter flame than coal. The boiler operates better provided the hot substance flow does not enter at too high a speed. The Lurgi-Ruhrgas preliminary degasing plant for 10 ton/hr raw coal has been successfully tested with two different cyclone firing systems of the power plant Fuerst-Leopold-Baldur in Dorsten. No optimal solutions have yet been found for spearation of the dust carried along by the production gas from the degasing shaft as well as for the separation of dust-free tar.

**40397** **APTIC NO. 62920**

Sparks, L. E.

EFFECT OF WATER VAPOR CONDENSATION ON PARTICLE COLLECTION BY SCRUBBERS. *Preprint, U.S.-U.S.S.R. Working Group on Stationary Source Air Pollution Control Technology, 26p., 1974. 51 refs. (Presented at the Symposium on Control of Fine Particulate Emissions from Industrial Sources, San Francisco, Calif., Jan. 14-18, 1974.)*

Water vapor condensation can be used to improve particulate collection by scrubbers. The improved particulate collection is due to diffusiophoresis and/or particle growth. Scrubbers which utilize condensation are defined as condensation scrubbers. The literature on condensation scrubbing is reviewed. Selected references are given on Flux Force/Condensation Scrubbers. The results of recent Environmental Protection Agency sponsored research on condensation scrubbing are presented. These results show that the particle collection efficiency of a condesnation scrubber is a function of the amount of water vapor condensed. The costs of condensation scrubbing are compared with the costs. of high energy scrubbing. The comparison indicates that condensation scrubbing is economically feasible for many applications. (Author abstract modified)

**40398** **APTIC NO. 64649**

Spear, Reginald Gordon and Richard Ripley Tracy

IMPROVEMENTS IN OR RELATING TO THE PURIFICATION OF NATURAL GAS. *(Tioga Wells Corp., Pasadena, Calif.) Brit. Pat. 1,353,967. 13p., May 22, 1974. (Appl. Nov. 8, 1971, 14 claims).*

A process for separating a high pressure natural gas feed mixture containing predominantly nitrogen and methane is described. The mixture is separated into two product streams, the first contains an excess of CH4 and the second contains an excess of N2. The feed mixture is expanded to a low pressure and the N2 is separated at a relatively low temperature into a separator while the CH4 is separated at a relatively high temperature into a second separator. The liquid from the first separator is recycled to the second separator, while the vapor from the first separator is recycled to the second separator. The recycled liquid is heated and the recycled vapor is cooled. This process eliminates the fractionation of conventional processes and the need for additional power consumption. The process is economical and enables purification of high pressure contaminated hydrocarbon gases to the extent that the gases are marketable.

**40399** **APTIC NO. 64473**

Stade, Bertil and Edward Hoglund

EMISSION-FREE EXHAUST PIPE JOINT AND CLAMP THEREFOR. *(Assignee not given.) U. S. Pat. 3,788,677. 9p., Jan. 29, 1974. 9 refs. (Appl. March 20, 1972, 11 claims).*

This invention relates to pipe joints and clamps (for vehicle exhaust systems) intended to be emission-free. The joints in previous exhaust systems are not emission-free, due either to the construction of the joints, or pipe clamps used with such joints, or both. These prior clamps which have a single bolt take- up have not been able to apply even compression around their circumferences with resulting loss of efficiency. The joint of the present invention comprises exhaust pipes formed with beaded ends providing abutting flange-like surfaces that are axially forced together by a clamp applying wedging forces on the external beads. Modified forms of the joint have pilot extensions on one pipe of the joined pair, the bead on this one pipe in each case being spaced from the free end of the pipe. The pilot extention is telescoped within the other pipe bringing the beads together side by side and the clamp is engaged over both beads. In some joints, such as those formed in pipes made of tough metal, a gasket may be inserted between the beaded ends. The clamp for the joints has a concave groove engaging over the pair of beads to apply the axial force by the wedging action produced when the clamp is constricted. The preferred clamp is made in two halves which have a hinged connection of great simplicity comprising a rectangular bight formed on one end of one half and a tongue formed on one end of the second half. The tongue lies in the bight and cannot move laterally because of the self-centering action produced when the clamp is engaged on the beads. The other end of each half comprises a tongue with perforations aligned to receive a bolt and nut to enable the halves to be clamped together, pivoting with respect to one another on the hinged connection. (Author abstract modified)

**40400** **APTIC NO. 63039**

Stock, D. E. and C. T. Crowe

THE EFFECT OF ELECTRODYNAMIC SECONDARY FLOW ON THE PERFORMANCE OF ELECTROSTATIC PRECIPITATORS. *Preprint, 14p., 1974. 7 refs. (Presented at the Heat Transfer and Fluid Mechanics Institute, 24th, Corvallis, Oreg., June 12-14, 1974.)*

A solution is presented which predicts the flow field for a two-dimensional particle-laden flow found in electrostatic precipitators. The effect of gas-particle and ion-gas momentum coupling is incorporated in the general development. The effect of particle and ion space charge is included in the electric field. The solution is used to analyze the turbulent gas-particle flow in a concentric electrostatic precipitator. The effect of electrodynamic secondary flow (electric wind) and the gas-particle momentum coupling have about the same magnitude and are opposite in direction. The numerical scheme was applied to a wire and pipe precipitator in a laboratory. The same scheme is directly applicable to a wire and plate precipitator, and such a configuration would show a much larger electric wind. The method can be extended to account for particle reentrainment and other conditions. (Author abstract modified)

**40401** **APTIC NO. 64694**

Strong, Herbert W., Jerrold E. Radway, and Henry A. Cook

CYCLICAL PROCESS FOR RECOVERY OF ELEMENTAL SULFUR FROM WASTE GASES. *(Basic Inc., Cleveland, Ohio) U. S. Pat. 3,784,680. 8p., Jan. 8, 1974. 4 refs. (Appl. Dec. 1, 1971, 4 claims).*

A process for removing sulfur dioxide from gases and recovering elemental sulfur is described. The gases are scrubbed with a slurry containing a metal sulfide which reacts with the SO2 to form a precipitate of predominantly metal sulfite and elemental S. A portion of the slurry is withdrawn and the precipitate is separated. The remaining slurry is recycled for reaction with additional SO2 and the precipitate is heated to remove the water and convert any metal thiosulfate to additional sulfite and elemental S. Some metal sulfate may be present. The elemental S is separated, and the sulfite and sulfate are then reduced to the sulfide which is recycled to the scrubbing slurry. Preferably, the metal sulfide is an alkali sulfide or alkaline earth sulfide. Unlike other SO2 removal processes, this process effectively and economically removes low concentrations of SO2 from combustion gases and recovers marketable elemental S. (Author abstract modified)

**40402** **APTIC NO. 63368**

Suetaka, Toru

ADSORPTION DEODORIZATION METHODS. *(Kyuchaku dasshuho ni tsuite (I)). Text in Japanese. Akushu No Kenkyu (Odor Research J. Japan), 3(14):26-34, March 1974. 26 refs.*

The types and characteristics of adsorbents, adsorption balances, adsorption retention, adsorption speeds, and adsorption apparatus are discussed. The adsorbents included are activated carbon, activated alumina, activated bauxite, activated soil, bone charcoal, synthetic zeolite, and synthetic adsorbents. The adsorption speed is mathematically analyzed and fluid interface membrane transference speed, pore dispersion speed, and contact filtering adsorption systems are discussed. The fixed layer adsorption apparatus, mobil layer adsorption system, hypersorption system, and multi-step fluidized layer system are discussed. The main characteristics of adsorption deodorization are: elimination of odor elements and other harmful gases simultaneously; fluctuation of odor elements concentration affects the deodorization process very little, whereas ozone and masking methods must be adjusted to the odor concentration; combustion and scrubbing are difficult to use when the concentration of odor is low, but adsorption tends to increase with lower concentrations; an adsorption system is easily understandable for laymen and the handling is simple; adsorbents must be selected according to the type of odor elements; adsorbents must be replaced or regenerated periodically, but regeneration is costly and is technically difficult.

**40403** **APTIC NO. 64724**

Sugamiya, Ryoji

A DESULFURIZER OF EXHAUST GASES EMITTED BY A COPPER SMELTER. *(Do-seirenjo ni okeru haien datsuryu sochi). Text in Japanese. Sangyo Kikai (Ind. Machinery), no. 283:20-22, May 1974.*

A new method for manufacturing sulfuric acid by treating exhaust gases from a reverberatory furnace is presented. The withdrawal rate exceeds 99.5% and magnesium hydroxide is employed as an absorbent in the method, which is capable of treating 90,000 N cu m/hr. The concentration of sulfur dioxide at the exit of the absorption tower is less than 100 ppm. The output of sulfuric acid is 6000 tons/hr. This method possibly will meet new standards because of its high rate of SO2 removal. Alkali is recirculated. No dangerous substances are employed and there is no danger to employees or of second environmental polluton. Sulfur dioxide is converted to sulfuric acid with a variety of uses. The operation can be conducted on a large scale and centralized treatment is available. Sulfur dioxide in a large range of concentrations and various gases from different types of sources can be treated with this method.

**40404** **APTIC NO. 63367**

Sugiura, Ginji

DEODORIZING EFFECTS OF CHICKEN EXCRETION DRYING BY WASTE WOOD CHARCOAL AND WOOD VINEGAR. *(Haizaitan to mokusakueki ni yoru keifun kansoji no shoshu koka). Text in Japanese. Mokuzai Kogyo (Wood Ind.), 29(5):206-208, May 1974. 8 refs.*

The deodorizing effects of wood bark charcoal and wood vinegar were experimented on chicken excretion drying odors. Most of the odorous elements in chicken excreta is ammonia, with some hydrogen sulfide, C2-C6 organic acid, indol, scatol, diketon, mercaptan, and low-class aliphatic acid. Tree bark charcoal contains 57.26 to 74.39% of carbon. Wood vinegar contains 3-7% of acetic acid, 1% formic acid, and some methanol, acetone, and soluble tar. Seventy-two kg of wood bark charcoal and coniferous tree charcoal were soaked in 50 l of wood vinegar, and the odorous gas was blown through the deodorization tank containing charcoal. The first day, the rate of deodorization was 100%, and up to 4 days, 74-92% of odor was eliminated. On the 6-7th day, the rate was 60-71%. When only new wood bark charcoal was used, the rate was 100% on the first day, but no elimination effect was noted on subsequent days; suddenly on the 5th day, 53-63% of the odor was eliminated. Soaking the charcoal in wood vinegar seemed to assure a good, lasting deodorizing effect at a low running cost, easy operation involving no liquid waste, no chemical damages on animals or humans, and a good disinfecting effect. The waste charcoal, after it loses the deodorizing effect, can be used as fertilizer (contains about 0.8% nitrogen). The method is applicable widely for treatment of animal excretions and fishmeal processing effluents.

**40405** **APTIC NO. 64720**

Takahashi, Akira

MANAGEMENT AND MAINTENANCE OF ABSORPTION SPECTROPHOTOMETRY NOX METERS FOR MAINTAINING ACCURACY. *(Kyuko kodoshiki NOx kei no seido ijii no tame no kanri to mentenansu ni tsuite). Text in Japanese. Keiryo Kanri Keisoku Keiso (J. Instrum. Control Assoc., Japan), 23(5):3-5, 1974. 1 ref.*

The absorption spectrophotometry type of nitrogen oxide meter is commonly called the Saltzman NOx meter. The coloration of Saltzman solution by nitrogen dioxide is analyzed at wavelengths of 540-550 nm, and the air is further lead to a solution of potassium permanganate to oxidize nitric oxide to NO2 and NO2 is again measured by the Saltzman solution. The sampling tube is teflon or pyrex glass. Teflon tubes should be exchanged every year and pyrex glass tubes should be washed. The trace air flow of 300 ml/min is difficult to adjust for accurate automatic measuring and it usually requires a large apparatus. A needle valve is used, but this type of meter is easily affected by flow rate fluctuation, and the flow quantity, adjustment, filter exchange, impinger, and oxidizer must be monitored constantly. In preparing the reagent, if the quality of N-ethylenediamine chlorinate is poor the color of the solution may cause error in the measurement. Also, the amount of reagent in the impinger must be exactly the prescribed amount. In addition, the fluctuation of light from the light source lamp, the soiling of the cell windows, and deterioration of the reagent can cause errors. The preparation of equivalent liquid for adjustment of reagent, the place of installation, the amount of sunshine, vibration, temperature, and humidity must be checked.

**40406** **APTIC NO. 64715**

Takasaki, Syoichi

DESULFURIZATION AND DENITRIFICATION BY A MORETANA TOWER-FUJINON- S-N PROCESS. *(Moretana-shiki datsuryu dassho doji shoriho- Fujinon-S,N.-ho). Text in Japanese. Nikkakyo Geppo (Mon. Bull. Jap. Chem. Ind. Assoc.), 27(5):239-244, May 1974.*

The first industrial-scale one-tower desulfurization- denitration system in the world, the Moretana lime-gypsum system was completed in November 1973 by Fuji Kasui Engineering Co. and Sumitomo Metal Industries Co. The system has a capacity of treating 62,000 N cu m/hr of oil boiler combustion gas. The trial operation was started in December and a 2000 hr operation test is in progress. Other systems developed by Fuji Kasui Engineering include the Fujinon-S,N process which eliminates both sulfur oxides and nitrogen oxides, the S-process, which produces lime-gypsum, the D-process which eliminates dusts, and the N-process which eliminates only NOx. Any combination of these processes is possible. The S-N process is highly efficient in simultaneous treatment of sulfur dioxide and NOx, and by adopting the Moretana tower as absorption tower, the process is further speeded up. A closed system for liquid waste treatment can be annexed, and the desulfurization and denitration can be achieved effectively regardless of the concentration of SO2 or NOx, or the amount of carbon monoxide, oxygen, carbon dioxide, or dusts. The structure is relatively simple and includes a cooling tower and a cooling water tank, an oxidation system, an absorption tower, an absorbent liquid tank, an eliminator, a fan, and an afterburner. For a 99.5% desulfurization and a 95% denitration effect, the operating costs, including chemicals, electricity, steam, water, manpower, a 7-yr payment plan, and a liquid treatment system is about $20-30/kl of oil.

**40407** **APTIC NO. 64436**

Tanaka, Masuo

PRESSURE LOSS CHARACTERISTICS OF BAG FILTERS. *(Baggu firuta no atsuryoku sonshitsu tokusei). Text in Japanese. Kemikaru Enjiniyaringu (Chem. Eng.), 19(6):13-17, June 1974. 10 refs.*

The characteristics of pressure loss of bag filters are examined by mathematical calculations and experiments. Equations are obtained for soiled filter dust resistance and time change, the resistance of clean filters, dust shaking and filter resistance, dust shaking energy and the rate of residue dusts, and the state of residue dusts. The relationship between the dust residue and newly accumulating dust load pressure loss is linear in the beginning, but as the dust load increases, the dust is compacted and resistance coefficient increases. However, in actual equipment, factors such as dust creation process, shaking method, and the type of filter fabric affect these relationships delicately, and the pressure loss is difficult to calculate either by theory or experiment. These factors affect the life of filter and the maintenance cost.

**40408** **APTIC NO. 63109**

Tartaglia, P. E.

A LOW POLLUTANT, HIGH ENERGY EFFICIENCY HYBRID HYDRAULIC POWER PLANTS. *American Society of Mechanical Engineers, New York, 8p., 1974. 9 refs. (Presented at the American Society of Mechanical Engineers. Intersociety Conference on Transportation, Denver, Colo., Sept. 23-27, 1973.)*

A low pollutant, high energy efficiency hybrid hydraulic power plant is described for use with any type of motor vehicle power source. The powerplant consists of four major components: a hydraulic pump, a hydraulic motor, an accumulator, and a primary power source (20 hp Wankel engine in the present case). The basic operation scheme has the primary power source coupled directly to the hydraulic pump which provides the necessary fluid under pressure to run the motor under steady state operating conditions. The accumulator stores fluid under pressure and releases it during periods of acceleration when the motor is demanding more power than the pump can provide. Emissions levels are very low because the primary power source is running at constant speed. No load emissions from a Wankel/dual catalytic muffler system arrangement are: 0.2% carbon monoxide, 0.1% carbon dioxide, 100 ppm hydrocarbons, and 0 ppm nitrogen oxides.

**40409** **APTIC NO. 64738**

Tatsutomi, Yasuo and Shigetake Yoshimura

INTAKE SYSTEM FOR INTERNAL COMBUSTION ENGINE. *(Toyo Kogyo Co., Ltd., Hiroshima-ken (Japan)) U. S. Pat. 3,782,346. 6p., Jan. 1, 1974. 6 refs. (Appl. March 29, 1971, 19 claims).*

An improved intake system for an internal combustion engine for effectively reducting the amount of unburned compounds contained in an exhaust gas while the engine is decelerating, maintaining the air-fuel ratio at an approximate value, is presented. Complete combustion of the air-fuel mixture can be achieved with substantial elimination of noxious unburned compounds normally present in an exhaust gas emerged from the exhaust system of the engine. Also, since complete combustion can be achieved, the occurrence of an afterburning in the exhaust system can be advantageously prevented. In the prior art, the air fuel mixture ratio is not adjusted to the appropriate value, and unburned compounds such as hydrocarbons, carbon monoxide, and carbon dioxide are emitted from the exhaust system. (Author abstract)

**40410** **APTIC NO. 62923**

Thompson, Robert E. S.

PROCESS FOR RECOVERING FOREST PRODUCT PLANT WASTES. *(Environment Inc., Guilford, Conn.) U. S. Pat. 3, 783,128. 16p., Jan. 2, 1974. (7 claims).*

A process for converting the wood wastes produced at lumber, pulp, and paper mills into steam and activated carbon is discussed. The steam may be used for processing the products or for conversion into electric power. The activated carbon can be used to filter the mill effluents. The process reduces air and water pollution to low levels which meet Federal standards. It reduces the daily demand on the natural water supply by 80-90%. It can burn the 30% of a tree which is generally wasted to provide a new fuel source. It requires little space and is very economical. Most of the components employed in this process have long been in commercial use, but never before have been tied together to achieve a closed circuit system with these capabilities. In the process, the wastes are first carbonized to char, and the char is treated in a second furnace to produce activated carbon or is briquetted and sold as char. The carbon and entrained solids are returned to one of the furnaces. Off gas from all furnaces is passed to a boiler for steam generation; the spent gas is passed through an absorber, if necessary, before release.

**40411** **APTIC NO. 62955**

Tice, E. A.

CORROSION TESTS IN FLUE GAS DESULFURIZATION PROCESSES. *Mater. Performance, 13(4):26-33, April 1974. 2 refs.*

Corrosion tests in a number of flue gas scrubbing processes designed for removal of sulfur dioxide and particulates are described. Tests were made in a venturi absorber scrubber using the limestone slurry process at a coal-fired utility boiler, a pilot plant coal-fired boiler using a flooded disc limestone slurry scrubber, smelter gas scrubbing with a limestone slurry, and a sodium sulfite sulfur dioxide recovery process at a sulfuric acid plant. All four gas scrubbing processes presented oxidizing acid environments, corrosive to carbon steel, high strength low alloy steel, nickel resistance cast irons, Monel alloy 400, and 70-30 copper-nickel. Chromium stainless steels had borderline passivity in these scrubbing media, suffering either general corrosion or significant localized pitting attack. In the chromium-nickel stainless steel family, pitting resistance increased with molybdenum content. In the limestone scrubbing processes associated with coal-fired boilers, type 316L stainless was the leanest alloy resistant to pitting. In the smelter gas scrubbing process, alloys of at least 6% molybdenum content were needed to become resistant to pitting. (Author conclusions modified)

**40412** **APTIC NO. 64465**

Tippmer, Kurt and Dieter Laufhutte

AMMONIA-HYDROGEN SULFIDE-CYCLE SCRUBBING METHOD FOR CRUDE COKE OVEN GASES. *(Firma Carl Still, Recklinghausen (Germany)) U. S. Pat. 3,789,105. 4p., Jan. 29, 1974, 1 ref. (Appl. Nov. 10, 1971, 6 claims).*

This invention provides a new ammonia-hydrogen sulfide-cycle scrubbing process for treating coke oven gases where the ammonia rich H2S wash liquor is regenerated in a deacidifier and the ammonia is distilled from the NH3-scrubber in a still. The process comprises: a first cycle in which regenerated, cooled, aqueous ammoniacal solution is circulated from the sump of the deacidifier to about the center or the upper parts of the H2S scrubber, and from the sump of the H2S scrubber back to the upper part of the deacidifier; and a second, hot cycle in which the regenerated aqueous ammoniacal solution issuing from the sump of the deacidifier is circulated to the upper part of the H2S-scrubber, and from the sump of the H2S scrubber back to the upper part of the deacidifier. The new method of the invention effects an improvement of the new H2S scrubbing efficiency of up to 95% without using more steam than for a scrubbing efficiency of only 85%. (Author abstract modified)

**40413** **APTIC NO. 64805**

Tomlinson, E. S.

CONTROL OF AIR POLLUTION IN THE 1970 S. *Plant Eng., 18(5):18-22, May 1974. 4 refs.*

The control of air pollution in Great Britain is discussed including legislation, the arrestment plant, and specific processes. Three Acts of Parliament control air pollution in England and Wales. The Alkali Works Regulation Act 1906 initially regulated waste hydrochloric gas and now includes noxious and offensive gases. The Public Health Act 1936 covers pollutants not covered in the Alkali Act. The Clean Air Acts 1956 and 1968 primarily limits smoke emissions. The arrestment plants improved under the impetus of legislation requirements and works, and manufacturers now know what limits have to be attained and are designed accordingly. They rely primarily on high chimneys and emission monitoring. Pollution problems and their control are discussed for the following processes: nitric acid, petroleum and petrochemicals, cement works, iron and steel works, electricity works, ceraamic works, nonferrous metals, and ammonia processes.

**40414** **APTIC NO. 64624**

Tomon, Eiichi

PROBLEMS IN DESIGNING BAG FILTERS. *(Baggu firuta sekkeijo no mondaiten). Text in Japanese. Kemikaru Enjiniyoringu (Chem. Eng.), 19)6):18-21, June 1974.*

Regardless of the dust concentration at the entrance, the concentration at the bag filter exit is maintained at a certain level, and this is one of the advantages of bag filters. But with the increase of dust concentration at the entrance, the filtering speed must be slowed down. The speed of gas passing the filtering area is expressed as m/min, and it is the treated gas quantity per unit filter area. With a woven fabric filter, the dust collection efficiency of the total fabric is 85-90%, but a thin layer of dust accumulated on the fabric sometimes increases the collection rate to over 99.5%. The best result is obtained when the layer is 0.3-0.5 mm. This residue is called the primary filter layer, and further accumulation is called the secondary layer. If the secondary layer is shaken off, the collection rate drops considerably. Therefore, the designing of a filter bag depends on how to retain the primary layer completely while shaking off the secondary layer. With an ordinary filter bag of 1 m/min filter speed, the flue gas dust concentration should be 50-200 mg/cu m. For stringent environmental standards greater filter area must be used. When using felt, retention of the primary layer (inner layer which infiltrates into felt fiber) is easier than with woven fabrics. The previous problem of woolen felt s weakness against heat was solved by the invention of needle punch synthetic felt, and the pulse jet method of shaking dust improved the collection rate. With these improvements, the pressure fluctuation is small and greater filter speed is possible.

**40415** **APTIC NO. 64842**

Tomoyama, Toshio

DESULFURIZATION OF STACK GAS AT OJI PAPER CO., TOMAKOMAI THERMOELECTRIC POWER STATION. *(Oji seishi Tomakomai karyoku hatsudensho ni okeru haien datsuryu). Text in Japanese. Karyoku Genshiryoku Hatsuden (Therm. Nucl. Power), 25(1):47-50, Jan. 1974.*

Desulfurization facilities utilized for thermoelectric power at a paper mill are discussed. The power station consumes 1300-1400 kl of 2.5%-sulfur heavy oil per day to provide 200,000 kwh of power required. Sulfur oxides produced by the power plant are 900 cu m/hr. The stack gas is desulfurized by absorption in a caustic soda solution. The sodium sulfite solution obtained is then used to manufacture semichemical pulp (SCP) or chemgroundwood pulp (CGP). The absorbent solution is sprayed onto a wire netting from above, thereby forming liquid membranes in the mesh. As the stack gas flows upward through the mesh of the net, its sulfurous acid gas content is effectively absorbed. The maximum desulfurization efficiency is 90-95%. By increasing or decreasing the number of wire nettings used, the efficiency can be adjusted as desired. In terms of economy, the sodium sulfite so produced costs about 8 cents/kg against 5 cents of commercially available Na2SO3. The balance of 3 cents is taken as an additional cost for pollution control. About 81 kg of sodium sulfite is produced per 1 kl of fuel, and the total amount of pollution control expense is about $2/kl of the heavy oil.

**40416** **APTIC NO. 63395**

Toropkina, G. N., V. P. Parakhnevich, K. T. Gubaydullina, N. Y. Kapustina, and L. V. Bukareva

CATALYTIC PURIFICATION OF WASTE GASES GENERATED IN PHENOL PRODUCTION. *(Kataliticheskaya ochistka otkhodyashchikh gazov proizvodstva fenola). Text in Russian. Khim. Prom. (Moscow), no. 5:347-348, 1974. 5 refs.*

Mathematical optimization of the catalytic purification of waste gases generated in phenol production, containing phenol, acetone, alpha-methylstyrene, and isopropylbenzene on a copper oxide catalyst is described. The rate of conversion was lowest for isopropylbenzene. This rate increased with increasing temperature and decreasing volume rate. The highest degree of conversion was at 430 C and at a volume rate of 10,000/hr. The negative effect of the volume rate of conversion was the strongest of all parameters. Practically quantitative oxidation of the waste gas components was achieved at a volume rate of 11,500/hr, a temperature of 450 C, and at a hydrocarbon content of 3-5 mg/l expressed as carbon dioxide. To make the catalytic conversion more economical, an increased hydrocarbon concentration of 10-12 mg/l should be used for additional heat supply in the catalyst layer.

**40417** **APTIC NO. 64818**

Ueda, Toshio

PREMUFFLERS FOR AUTOMOBILES. *(Jidoshayo pure mafura). Text in Japanese. (Aluminum Plating Industries (Japan)) Japan. Pat. Sho 49-23093. 3p., June 13, 1974. (Appl. Dec. 28, 1970, 1 claim).*

An automobile premuffler designed for reduction of toxic gas concentration in automotive exhaust emission by catalytic oxidation is described. In the muffler, consisting of an inner pipe with numerous holes on the pipe wall and a shell enclosing the inner pipe, the inner surface or the inner and outer surfaces of the inner pipe and/or the inner surface of the shell are coated with a 0.01-0.2 mm layer of aluminum by the immersion method. The cross-section of the inner pipe or shell wall shows the iron core, intermediate layer of iron infiltrated with Al, and Al layer on the surface. By the catalytic effect of Al at elevated temperature, the carbon monoxide, hydrocarbons, and nitrogen dioxide contained are oxidized. A premuffler with an inner pipe coated with a 0.01-0.2 mm Al layer by immersion in molten aluminum at 720 C for several minutes was tested at four driving modes using a 1300 cc engine capacity automobile. The results indicated marked decrease in NO2 and some decrease in HC and CO concentrations compared to those of the existing premuffler. For example, the NO2 concentration was decreased to 300-1500 ppm from 1200-4000 ppm at acceleration and to 200-800 ppm from 900-2900 ppm at deceleration.

**40418** **APTIC NO. 61484**

Upmalis, Alberts

STACK AND MAINTENANCE OF CLEAN AIR. *(Schornstein und Luftreinhaltung). Text in German. Gesundh-Ing., 95(5):129-134, 1974. 6 refs.*

Power plants and industrial enterprises emit large flue gas quantities into the atmosphere; a 150 MW plant, for instance, discharges 770,000 cu m/hr. The enterprises are usually requested to control dusts and utilize high stacks. The effect of a high stack on the dispersion of the emitted gases depends to a large extent on the topography. In the Dutch flatland the stacks usually have a height of 150 m, in some cases even 200 m. The American power plants are equipped with very large stacks, from 245 to 368 m. To limit the emission of sulfur dioxide and sulfur trioxide, flue gas desulfurization processes are being developed. To control carbon monoxide forests must be enlarged. The designs of three stacks (220 m, 155 m and 90 m) are described.

**40419** **APTIC NO. 63399**

Verkamp, F. J., A. J. Verdouw, and J. G. Tomlinson

IMPACT OF EMISSION REGULATIONS ON FUTURE GAS TURBINE ENGINE COMBUSTORS. *J. Aircraft, 11(6):340-344, June 1974. 3 refs. (Presented at the American Institute of Aeronautics and Astronautics Propulsion Conference, 9th, Las Vegas, Nev., Nov. 16, 1973, Paper 73-1277.)*

Two hundred and twenty-four low emission gas turbine research combustors were tested under the following future low emission gas turbine combustor categories: Modified Conventional Combustors and Advanced Low Emission Combustors. Modified Conventional Combustors, featuring airblast fuel injectors and primary zone fuel/air ratio control, have marginal feasibility for meeting existing EPA 1979/81 aircraft emission regulations. Further stringency in the emission regulations would require Advanced Low Emission Combustors, which have demonstrated a 90% emission reduction. However, they incorporate features that at current technology levels will require compromises in gas turbine engine size, cost, durability, reliability, and cycle efficiency. (Author abstract)

**40420** **APTIC NO. 63244**

Vorontsova, V. A.

PILOT PLANT FOR THE DRYING AND PURIFICATION OF NATURAL GAS. *(Opytno-promyshlennaya ustanovka dlya osuskhi i ochistki prirodnogo gaza). Text in Russian. Gaz. Prom., no. 3:16-17, 1974.*

A molecular sieve type pilot plant for the drying and purification of natural gas with 0.3-0.5 g moisture and 0.61-0.84 g hydrogen sulfide per cu m is described. The pilot plant is composed of a horizontal and another vertical separator, three vertical, CaA type ceolite-filled adsorbers, and a burner assembly. After moisture separation in the separators, the natural gas is admitted to the adsorbers under 55 kg/sq cm pressure for the removal of the sulfur compounds. Spent ceolite is regenerated by hot, dry gas blown under 5-8 kg/sq cm pressure for 5-8 hrs until the $H_2S$ concentration in the regenerating gas falls to 0.02 g/cu m.

**40421** **APTIC NO. 64877**

Vukovic, D. V., F. K. Zdanski, G. V. Vunjak, Z. B. Grbavcic, and H. Littman

PRESSURE DROP, BED EXPANSION AND LIQUID HOLDUP IN A THREE PHASE SPOUTED BED CONTACTOR. *Can. J. Chem. Eng., 52(2):180-184, April 1974. 35 refs. (Presented at the American Institute of Chemical Engineers-Canadian Society of Chemical Engineers, Joint Conference, 4th, International Symposium on Spouted Beds, Vancouver, British Columbia, Sept. 9-12, 1973.)*

Data on the pressure drop, bed expansion, and liquid holdup in a three-phase spouted bed contactor with an initial bed height of 243 mm were obtained as a function of the gas and liquid flow rate. Polyethylene spheres 10 mmm in diameter with a density of 320 kg/cu m were spouted in a 194 mm column using a 30 mm nozzle. The spouted bed contactor with gas and liquid mass flow rates of 2.18 and 1.88 kg/sq m/sec, respectively, had similar pressure drop per unit area of particle surface, total liquid holdup per unit volume of operating bed, and active holdup, as a fluidized bed contactor. The potential uses for the three-phase spouted bed contactor are similar to those for which fluidized bed contactors have been used, as well as for high pressure gas purification, scrubbing of dusty gases containing sub-micron particles, contacting gases to slimy liquids, and chemical reactors. (Author abstract modified)

**40422** **APTIC NO. 64899**

Watanabe, Tamotsu

DUST SCATTERING PREVENTION DEVICE. *(Funjin hisan boshi). Text in Japanese. (Japan Crafts Industries, Co., Ltd. (Japan)) Japan. Pat. Sho 49-22738. 2p., June 11, 1974. (Appl. Oct. 19, 1970, 1 claim).*

A device for preventing the scattering of particles with ionogenic surfaces in the process of pouring them into the treatment tank is described. Based on the principle of the electrostatic precipitator, a high negative potential discharge electrode is suspended over the treatment tank which functions as an electrically grounded collecting electrode. The powder particles scattered into the air are charged by applying high voltage in the order of tens of thousands to hundreds of thousands volts, and are electrostatically settled into the treatment tank. The distance between the discharge electrode and treatment tank varies. Distances in the range of several tens of cm are suitable. Metallic wire, metal bar, metal plate, and plastic cores of nylon or polypropylene coated with electroconductive rubber mixed with carbon black are used as discharge electrodes. The particles which can be collected by this device include organic and inorganic pigments such as red oxide and chrome yellow, dyes, cement, and lime. Liquids such as water, oil, and other liquids required for the preparation of slurry, paste, or suspension can be placed in the treatment tank. The polarity of electrode can be reversed depending on the electrical nature of the particles so that the particles will be drawn toward the treatment tank. The use of this device reduces the loss of powdered materials during handling and also prevents pollution due to the scattering of particles into the atmosphere.

**40423** **APTIC NO. 64706**

Wentorf, R. H., Jr. and R. E. Hanneman

THERMOCHEMICAL HYDROGEN GENERATION. *Science, 185(4148):311-319, July 26, 1974. 19 refs.*

Thermochemical hydrogen could play an expanding role in future energy and chemical feedstock needs. The production of hydrogen in closed-cycle thermochemical and other processes is reviewed. Economic comparisons of hydrogen fuel are made. Various uses for hydrogen are discussed. A useful set of criteria are described for the screening and selection of potentially viable, multistep, closed-cycle thermochemical processes for hydrogen generation. Three illustrative, new closed-cycle processes are discussed, indicating potential, overall thermal efficiencies ranging from 40 to 60%. Combined thermochemical-electrolytic schemes also warrant further consideration. Principal technical probelsm in the development of such thermochemical closed-cycle and mixed-cycle processes are expected to include primarily material compatibility, reaction kinetics, separation techniques, and heat-exchanger systems. As natural gas supplies decline and prices rise, new open-cycle thermochemical processes based on water and fossil fuel feedstocks will be important in supplying hydrogen. Conventional electrolysis does not appear to be a competitor for large-scale supplies in this century unless very low off-peak electrical power rates become available, although electrolysis will be the best technique for some small-scale uses. (Author conclusions modified)

**40424** **APTIC NO. 64504**

Wigg, Eric Edward

REMOVAL OF NITROGEN OXIDES FROM EXHAUST GASES USING COPPER-NICKEL CATALYST. *(Esso Research and Engineering Co., Linden, N. J.) Brit. Pat. 1,351,989. 7p., May 1, 1974. (Appl. July 21, 1971, 7 claims)*

A catalytic method of reducing nitrogen oxide emissions from internal combustion engines is described which utilizes a nickel-copper alloy for improved NOx removal. The exhaust gas is passed in contact with a nickel-copper alloy containing at least 40% by weight of nickel and no more than 0.1% by weight of manganese. Alloys containing 50-95% by weight of nickel are preferably used. The nickel-copper alloy is preferable to high purity nickel as an engine exhaust emission catalyst because high purity nickel gives poorer NOx conversions at temperatures encountered during engine warmup (below 1200 F).

**40425** **APTIC NO. 64469**

Willis, Floyd H.

EXHAUST DEVICE FOR AUTOMOTIVE VEHICLES. *(The Raymond Lee Organization, New York) U. S. Pat. 3,788,417. 3p., Jan. 29, 1974. 3 refs. (Appl. April 26, 1972, 1 claim).*

An automobile exhaust device is described which improves and facilitates the scavenging of the exhaust gases of the vehicle when it is moving and increases the power and economy of operation, while reducing pollution by providing cleaner combustion and exhaust. The device comprises a funnel having a sheet of metal formed in substantially frustoconical configuration affixed to and extending outward from the open free end of the tail pipe, with the funnel having a throat and opening at substantially right angles to an air stream passing the vehicle when in motion, and a baffle mounted in the throat of the funnel, comprising a disc coaxially mounted in the funnel throat and positioned at right angles to the axis of the funnel.

**40426** **APTIC NO. 64630**

Yada, Yasuo and Ikuo Yamada

ODOR CONTROL TECHNIQUES AND THE TANAKA DEODORIZATION APPARATUS--GAS FLUIDIZING ADSORPTION METHOD. *(Akushu boshi gijutsu to Tanaka-shiki dasshu sochi ni okeru kiso ryudo kyuchakuho no jissai). Text in Japanese. Akushu No Kenkyu (Odor Research J. Japan), 3(14):46-54, March 1974. 5 refs.*

The Tanaka Deodorization system utilizes pulverized adsorbent in a fluidizing chamber. The powdered adsorbent of silica alumina inorganic elements is continously supplied to the odor gas current from the suction entrance. The mixture of gas current and adsorbent forms whirlpools and rapidly goes up the adsorbent pipe. While traveling through the pipe, the adsorption reaction is completed. The solid-air mixture gas is then led into the first separation cyclone, and most of the adsorption medium is separated and drops into the hopper under the cyclone. The gas then enters the second separation device of a bag filter, and after complete filtering, clean, dust-free air is emitted in the atmosphere. A suitable amount of adsorbent is predetermined for each gas according to the amount of gas. The required amount is stored in the hopper. The adsorbent extracted from the hopper under the cyclone can be returned to to the adsorbent hopper and recirculated 10-15 times in 70-100 hr before its capacity is completely saturated. Two important conditions for effective adsorption are: sufficient contact time for gas and adsorbent, and sufficient mixture of gas and solid adsorbent. Therefore, the length of adsorption pipe, the size of pipe, and the stirring mechanism must be designed properly. The entire system is automatically controlled and feed-back is provided for each segment for inspection.

**40427** **APTIC NO. 64939**

Yamamoto, Tamechika and Takuro Ushida

AIR POLLUTION BY VOLATILE ORGANIC SUBSTANCES AND THEIR REMOVAL. *(Kihatsusei yukibutsu ni yoru taiki osen to sono jokyo). Text in Japanese. Toso to Toryo (Finish Paint), 5:51-54, 1974.*

Air pollution by volatile organic solvents often result from paint, ink, paper and resin industries. These solvents include toluene; xylene; esters such as ethyl acetate and butyl acetate; ketones such as acetone, methyl ethyl ketone, and methyl isobutyl ketone; and alcohols such as methanol, isopropanol, and butanol. Other solvents such as alkanes and styrene are also very common. Activated carbon has long been used to adsorb organic substances in air by passing the polluted air through an activated carbon layer to which the undesirable substances are adsorbed. The activated carbon can be easily regenerated by cleaning with steam to desorb the organic substances which are recovered by condensing. The organic solvents can also be eliminated by passing the polluted air into a combustion chamber. This is an ideal method when waste heat is available, which does not require additional cost for fuel. The lower limits of ignition of most of the organic solvents are 1 to 4%, which is high compared to the concentration in the polluted air. Catalytic combustion is therefore required for continuous and complete removal of the solvents. Platinum, paladium, and copper oxides are the most common catalysts used. The Pt and Pd are usually used at 0.1 to 0.3% level with activated alumina as supporter. The reaction temperature is 300 C to 350 C with Pt or Pd as catalyst, but a higher temperature of 350 C to 400 C is needed when copper oxide is used.

**40428** **APTIC NO. 63158**

Yoshida, Shuusuke and Atsushi Fujita

NEW FLUE GAS DESULFURIZATION PROCESS USING GYPSUM RECOVERY METHOD. KBCA SULFUR DIOXIDE REMOVAL PROCESS FOR RECOVERING GYPSUM FROM ACIDIC AMMONIUM SULFATE. *Chem. Economy Eng. Rev., 6(3):37-42, March 1974.*

A sulfur dioxide removal process is described for removing sulfur from boiler flue gas while neutralizing alkaline waste water. Sulfur dioxide is first absorbed by a slightly acidic ammonium sulfate solution; then the SO2 absorbed is subjected to air oxidation with pH control, in order to form a slightly acidic ammonium sulfate solution. Part of the absorbent is removed, and calcium oxide and calcium hydroxide are added to recover gypsum. The ammonia water is then recycled. Since the SO2 absorbent is controlled to a pH value of between 3 and 4, the liquid/gas ratio of the absorbent is smaller than that for sulfuric acid-gypsum process and the aluminum sulfate-gypsum process. The reactions in the absorption process are described, and test plant data, oxidation, gypsum crystallization, and the process are discussed.

**40429** **APTIC NO. 63281**

Yoshida, Tetsuo

THE WET TYPE DUST COLLECTION. *(Shisshiki shujin). Text in Japanese. Preprint, Japan Society of Chemical Engineers, Tokai Branch, Nagoya, 1974. 9 refs. (Presented at the Japan Society of Chemical Engineers, Tokai Branch, Study Meeting on Behavior of Microparticles and Dust Collection, 32nd, Nagoya, Japan, Jan. 25, 1974.)*

The principles and mechanism of various types of particle growth characteristic to the wet type dust collectors, and their influence on collection efficiency are discussed. The types of particle growth are: diffusiophoresis accompanied by coagulation of steam on the liquid surface or by evaporation, thermophoresis of dust particles accompanied by the temperature field created around the liquid, and coagulation of particles around saturated steam accompanied by cooling of a high temperature gas. Mathematical analyses of these phenomena are presented with equations and graphs. In actual wet type collectors, the above mentioned types of particle growth work in combination (as proven in experiments). The first experiment features the use of a steam atomizer to increase both humidity and temperature, and sudden quenching. When the steam quantity is large (and when the temperature is high), the dust collection rate increases greatly. In another experiment, a cyclone and an impinger with known performances are connected and steam is supplied. When the steam heating temperature is 20 C, the collection rate is 42.3%, and when the temperature is 60 C, the collection rate is 85.4%.

**40430** **APTIC NO. 64843**

Yoshimura, Toshifumi

THOROUGHBRED 101 OPERATIONS FOR MITSUBISHI RAYON CO., LTD. OTAKE FACTORY. *(Mitsubishi reiyon otake kojo hatsudensho haien datsuryu). Text in Japanese. Karyoku Genshiryoku Hatsuden (Therm. Nucl. Power), 25(1):57-60, Jan. 1974.*

The Chiyoda Thoroughbred 101 desulfurization process is described. The Thoroughbred Process mainly consists of the absorption, oxidation, and crystallization, producing gypsum as the by-product. It uses an iron catalyst (iron) dissolved in the absorbent for acceleration of the oxidation. Possible poisoning of the catalyst with heavy metals and other harmful gases contained in the flue gas has been examined through a 14-month study with a pilot plant. The iron catalyst is unaffected by any heavy metal or possible harmful gas. The desulfurization plant is designed to handle 90,000 N cu m/hr of the flue gas with a sulfur dioxide concentration of 1700 ppm and achieve 90% or higher desulfurization of the gas while producing 27 tons/day of gypsum. A dust collection device is also combined with this system, successfully reducing the initial dust content of 0.2 g/N cu m to 0.03-0.04 g/N cu m.

**40431** **APTIC NO. 64839**

Yuen, Yat Chuen and Kin Sun Yuen

GAS-LIQUID CONTACTING APPARATUS. *(Assignee not given.) U. S. Pat. 3,788,042. 4p., Jan. 29, 1974. 3 refs. (Appl. March 16, 1972, 4 claims).*

An apparatus is described for cleaning automobile exhaust gases, including a screen immersed in a liquid and surmounted by an inverted trough having closed ends such that at least a part of the gas fed to the trough will pass more than once through the screen before reaching the gas outlet. The invention provides a simple and effective gas cleaning device which avoids the problem of loss of catalytic activity because of poisoning by lead.

**40432** **APTIC NO. 64955**

Zenkner, Kurt

THERMAL AFTER-BURNING OF WASTE GASES FROM INDUSTRIAL PLANT. *(Assignee not given.) Brit. Pat. 1,349,075. 11p., March 27, 1974. (Appl. May 27, 1971, 16 claims).*

This invention relates to a process for thermal afterburning of waste gases from industrial plants, such as drying chambers and the like, containing oxidizable foreign bodies, fluid particles, or gas, and a device for carrying out this process. The aim of thy invention is to achieve total mixing of the components to be burned in the waste gases with oxygen during this thermal afterburning, to bring the temperature to ignition temperature, to enable the components for burning to remain in combination with their reaction counterpart, oxygen, long enough to achieve total combustion, and to keep the energy consumption of the combustion plant as small as possible.

**40433** **APTIC NO. 62898**

Environmental Protection Agency, Research Triangle Park, N. C., Test and Evaluation Branch

EVALUATION OF AN AUTOMOBILE POWER AND DECELERATION GOVERNOR. *Rept. 74-29 AWK, 4p., April 1974.*

A laboratory and engineering evaluation was given to a Power and Deceleration Governor. The device is a vacuum controlled throttled valve assembly installed between the carburetor and the engine intake manifold. The control mechanisms affects a carburetion cutoff during deceleration and limits throttling during acceleration. The cost of the device is approximately $50, and it can be installed in about one hour. The device caused an 18% increase in hydrocarbon emissions, a 23% decrease in carbon monoxide, a 13% increase in carbon dioxide, a 45% decrease in nitrogen oxides, and a 5% penalty in fuel economy.

**40434** **APTIC NO. 62924**

Environmental Protection Agency, Research Triangle Park, N. C., Test and Evaluation Branch

PRELIMINARY REPORT - UOP CATALYST AND DANA EGR APPLIED TO MEDIUM DUTY VEHICLES. *Rept. 74-22 AWK, 5p., March 1974.*

Medium duty vehicles have many operational similarities to light duty vehicles, and state authorities have expressed interest in retrofit control for this vehicle class. Therefore, the feasibility of retrofitting this class of vehicles was studied. A durability program was undertaken using the Dana Retronox exhaust gas recirculation (EGR) system and UOP oxidizing catalysts. The EGR system and catalysts were installed on two trucks and tested every 4000 mi for 25,000 mi. Emission reductions were 41% hydrocarbons, 28% carbon monoxide, and 34% nitrogen oxides with the EGR system; 94%, 56%, and 70%, respectively, for the EGR system plus the catalyst system, and 67%, 50%, and -6%, respectively, after 4000 mi for the Chevrolet C-50 Stake Body Truck. These reductions were, respectively, -20%, -59%, and 28% for the EGR system; 76%, 78%, and 44% for the EGR and catalyst system; and 9%, -27%, and 30% after 4000 mi for the Ford F-250 Pick-up Truck. The low mileage emissions were similar to those previously reported for an EGR/catalyst retrofit. The catalysts substantially failed at low mileage.

**40435** **APTIC NO. 62926**

Environmental Protection Agency, Research Triangle Park, N. C., Test and Evaluation Branch

EFFECT OF METHANOL-GASOLINE BLENDS ON EMISSIONS. *Rept. 74-25 AW, 4p., March 1974.*

The influence of methanol addition to gasoline on emissions was studied. The blend with 11% methanol caused a 17% increase in hydrocarbons, a 41% decrease in carbon monoxide, a 35% decrease in nitrogen oxides, and an 8% decrease in fuel economy. The 7% blend caused a 10% increase in HC, a 34% decrease in CO, a 24% decrease in NOx, and a 6.5% decrease in fuel economy. Changes would have to be made to the carburetion to correct the lean misfire which caused increased HC emissions. The vehicle also exhibited poor driveability when running on the methanol/gasoline blend, typical characteristics of overlean operation. The separation of the blend to low ambient temperatures and moisture would indicate potential problems requiring extensive investigation and resolution prior to the widespread use of such blends. Significant deterioration in fuel economy on both a volume and energy basis resulted from use of the methanol/gasoline blends.

**40436** **APTIC NO. 62962**

CONTROL OF STORAGE TANK EVAPORATION. *Oilweek (Calgary, Can.), 25(8):35, April 8, 1974.*

The control of venting from storage tanks to meet emission standards and reduce evaporation loss can be accomplished by restricted venting control (for liquids with a lower density and a higher volatility than nitrogen) or by an N2 barrier (for liquids with a higher density and lower volatility than N2). Restricted venting confines vapors from volatile liquids inside the tank at a slight positive pressure, releasing as little vapor as possible. Vented vapor may be recycled, mixed with a fuel, or burned. In N2 barrier control, the space above the liquid is filled with N2 which serves as a sacrificial gas and as a barrier to inhibit vaporization of the stored liquid. These methods are described.

**40437 APTIC NO. 62964**

HOW A MEAD KRAFT MILL OPERATES WITHOUT AIR ENVIRONMENT PROBLEMS. *Paper Trade J., 158(14):26-29, April 8, 1974.*

The pulp mill at Escanaba, Mich. is described. It has one of the most advanced and effective systems for air and odor pollution control. However, it required many changes in design and operation to successfully achieve complete control. The kraft mill combined the latest technology for control of odors and particulates. Startup problems included the electrostatic precipitator being not as efficient as design specification resulting in annoying fallout of particulate matter and sporadic odors caused by equipment malfunctions. Four cyclone wet scrubbers were added after the precipitator to solve the problem. The odor control system consists of burning the gases followed by adsorption, absorption, or combustion. Digester odor control consists of incineration in the lime kiln; this system had to be enlarged. Vapors from the evaporators are condensed and the odors are incinerated. The recovery boiler uses flue gas to preheat boiler water; the flue gases then go to the electrostatic precipitator and scrubbers. The lime kiln destroys odors from the digesters, evaporators, and stripper column. Brown stock washing, miscellaneous odor sources, steam stripping, control of the systems, and a summary of the improvements to the Escanaba odor control system are also discussed.

**40438 APTIC NO. 63124**

(Inventor not given.)

SO2 ABSORPTION SYSTEM WITH REGENERATION OF ABSORBENT. *(Babcock and Wilcox, Co., New York) Brit. Pat. 1,344,700. 7p., Jan. 23, 1974. (Appl. May 18, 1971, 14 claims).*

A process for the absorption of sulfur dioxide from flue gases resulting from the combustion of fossil fuels is described. Other processes are not economically justifiable because the removal sulfur is not converted to a usable or salable form. This process provides for the removal of SO2 and means for cleaning the fuel gases to reduce entrained solid matter. There is a separate means for passing the gases through a gaseous SO2 absorbing fluid containing magnesium oxide to produce hydrous crystals of magnesium sulfite. The crystals are heated to reduce the amount of the water of crystallization and are mixed with granulated carbon. The mixture is heated in the presence of a binder to form pellets which are thermally decomposed to produce separate streams of a gaseous effluent containing SO2 gases and particles of magnesium oxide. By accurately controlling the air flow and by adjusting the amount of pellets and coal, a product containing a mixture of H2S and CO2 may be formed. The gaseous product may be passed to a conventional Claus process plant for the direct production of S.

**40439 APTIC NO. 63292**

POLLUTION PROBLEMS. *(Les problemes de pollution). Text in French. Rev. Met. (Paris), 71(3):293-299, March 1974.*

Planned air and water pollution abatement measures at the new SOLMER metallurgical plant in France are described. The ground-level sulfur dioxide concentrations will be abated by the construction of high stacks. The SO2 emission will amount to 90 tons daily. The maximum allowable dust emission of 150 mg/N cu m from the ore-dressing plant will be met by the use of electrostatic precipitators providing for a residual dust concentration of 70 mg/N cu m. Venturi scrubbers with a high pressure loss will reduce the dust concentration to 40 mg/N cu m (humid air) against a maximum allowable concentration of 120 mg/N cu m in the steel mill. High-efficiency exhaust systems will be installed for the cokery. The dust emission from the coke quenching unit is guaranteed to be less than 0.05 g/cu m.

**40440 APTIC NO. 64471**

(Inventor not given.)

APPARATUS FOR BURNING THE COMBUSTIBLE CONSTITUENTS IN EXHAUST GASES FROM COMBUSTION APPARATUS. *(Eberspaecher (J.) O. H. G., Esslingen (Germany)) Brit. Pat. 1, 353, 512. 3p., May 22, 1974. (Appl. April 28, 1971, 8 claims).*

An apparatus for burning the combustible constituents present in heated exhaust gases issuing from combustion apparatus is described. Other afterburners are very elaborate and involve a relatively high loss of pressure since they generate a counterpressure downstream of the exhaust valves of the internal combustion engine. Their use is limited and is even impossible in some low to medium rating internal combustion engines. These disadvantages are avoided by mounting the heat pipe centrally in an existing exhaust manifold of an internal combustion engine and/or in the exhaust pipe connected to the exhaust manifold, without substantially changing the dimensions, so that the exhaust gases flow all around the heat pipe. The heat pipe may also be constructed as a double walled tube, forming a conduit for the exhaust gas. A capillary fabric and a vaporizable substance are enclosed in the annular cross sectional space between the walls of the double walled tube. The tube is internally insulated which is an added advantage when the apparatus is used in motor vehicles.

**40441 APTIC NO. 64474**

(Inventor not given.)

THE REDUCTION OF THE CONCENTRATIONS OF COMBUSTIBLE CONSTITUENTS IN INTERNAL COMBUSTION ENGINE EXHAUST GASES. *(Nissan Motor Co., Ltd., Yokohama (Japan)) Brit. Pat. 1,353,644. 17p., May 22, 1974. (Appl. May 5, 1971, 44 claims).*

A method and apparatus for reducing the concentrations of unburned hydrocarbons and carbon monoxide from gasoline powered internal combustion engines are described. The concentration of the gases is closely related to their temperature and that of the engine cooling water. The concentrations decrease considerably as the water and gases are warmed up to approximately 50 C and 550 C, respectively, after the motor vehicle has completed about two mode cycles from the cold engine condition. The concentrations are reduced to minimums and are maintained substantially constant after the temperatures of the water and gases have reached approximately 80 C and 600 C, respectively. A method was developed to detect the temperature of the exhaust gases and/or cooling water so that an electric signal is produced when the temperature is below a predetermined level. In the presence of the electric signal, the engine exhaust gases are heated by a hot gas which is produced through combustion of a combustible mixture of fuel and air passed to the exhaust system.

**40442 APTIC NO. 64499**

(Inventor not given.)

IMPROVEMENTS IN OR RELATING TO A PROCESS FOR EXTRACTING DUST FROM A GAS. *(Mitsui Toatsu Chemicals Inc., Tokyo (Japan)) Brit. Pat. 1,343,310. 4p., Jan. 9, 1974. (Appl. Dec. 14, 1971, 7 claims).*

A process for removing dust, aerosol, or mist from a gas is described, with a preferred form of the invention relating to the removal of urea dust from a urea prilling operation. The dust-containing gas is passed through a layer of porous open-celled foamed material to remove the dust from the gas, with the porous material being impregnated with a solvent for the dust. The preferred form involves first washing the exhaust air stream with water or an aqueous urea solution prior to passing the depleted exhaust stream through the foamed material.

**40443** **APTIC NO. 64500**

(Inventor not given.)

ELECTROSTATIC PRECIPITATOR AND GAS SAMPLING SYSTEM. *(Sherritt Gordon Mines Ltd., Toronto, (Canada)) Brit. Pat. 1,343,341. 7p., Jan. 9, 1974. (Appl. July 13, 1971, 8 claims).*

An electrostatic precipitator is described which is particularly suited for use in gas sampling systems for the removal of finely divided solid particulates from sample streams withdrawn from ore reduction roasters. The precipitator consists of an electrically conductive closed housing containing a partition separating an ionization and collection chamber. The ionization chamber includes a gas inlet and an ionization electrode, while the collection chamber includes a gas outlet and a collector electrode. The housing includes a dust collection chamber into which dust from the ionized gas falls as the gas passes around an edge of the partition.

**40444** **APTIC NO. 64501**

(Inventor not given.)

IMPROVEMENTS IN DEVICES FOR RECIRCULATING EXHAUST GASES IN INTERNAL COMBUSTION ENGINES. *(Regie Nationale Des Usines Renault, Hauts de Seine (France)) Brit. Pat. 1,343,946. 7p., Jan. 16, 1974. (Appl. June 3, 1971, 13 claims).*

An exhaust gas recirculation device of relatively simple design as compared to prior art devices is described for the reduction of automotive internal combustion engine nitrogen oxide emissions. The recirculation system improves engine operating conditions by selective recirculation of exhaust gases between the exhaust gas expansion muffler and the induction manifold. A distributor valve opens or closes at various predetermined engine speeds according to pre-adjusted throttle opening or output values and under the action of various control means. The recirculation system improves cold-starting conditions and high speed operation, while reducing NOx emissions at transient engine speeds.

**40445** **APTIC NO. 64503**

(Inventor not given.)

IMPROVEMENTS IN GAS SCRUBBING. *(Waagner-Biro Aktien-Gesellschaft, Vienna (Austria)) Brit. Pat. 1,342,997. 5p., Jan. 9, 1974. (Appl. Feb. 1, 1972, 19 claims).*

A venturi type scrubber for removing dust or contaminant gases from gas streams is described which does not require large volumes of fresh scrubbing liquor as in prior art venturi scrubbers. Parallel streams of the raw gases are contacted with a scrubbing liquor which is allowed to fall by gravity in a venturi and form curtains of liquor in the convergent entry portion of the venturi. The raw gases are conducted upwardly through the venturi so that the kinetic energy of the parallel gas streams deflects the curtains of liquor and disperses the liquor in the form of droplets which become distributed throughout the entire cross-section. The raw gas streams and droplets are combined and passed through the throat of the venturi and then into the diverging portion. The liquor is then separated from the gas downstream of the venturi.

**40446** **APTIC NO. 64507**

(Inventor not given.)

APPARATUS FOR THE CONTROLLED VENTING OF GASEOUS EFFLUENTS. *(Agence Nationale De Valorisation De La Recherche-Etablissement Public, Courbevoie (France)) Brit. Pat. 1,351,537. 6p., May 1, 1974. (Appl. Jan. 17, 1972, 8 claims).*

A method and apparatus for controlled venting of gaseous effluents such as those arising from the treatment of hydrocarbons is described which minimizes irregular gas flow associated with other such devices. The device consists of a vessel for containing liquid up to a predetermined level, a feed pipe for gaseous effluents having an end portion dipping down into the vessel below the liquid level, and a means for defining a series of chambers stacked inside one another surrounding the end portion of the feed pipe. The means defining each chamber is open at its top and has an opening at its bottom, whereby increased flow of the gaseous effluents causes a drop of the liquid level in the feed pipe which expels the liquid in the innermost chamber and with further increased flow of the gaseous effluents expels the liquid in successive surrounding chambers, enabling the escape of the gas straight through the emptied chambers.

**40447** **APTIC NO. 64511**

(Inventor not given.)

METHOD AND APPARATUS FOR PREPARING A REACTANT FOR INTRODUCTION TO A GAS SCRUBBER. *(Combustion Engineering, Inc., Windsor, Conn.) Brit. Pat. 1,351,823. 6p., May 1, 1974. (Appl. Oct. 26, 1971, 11 claims).*

A method is described for preparing reactants for introduction into wet scrubbers for sulfur oxide removal from flue gases. The reactant is fed in the solid state to an entrainment chamber through which a portion of the flue gas is then passed for entrainment of the reactant in the flue gas fraction. The gas entrained reactant is than conducted to a slurry tank in which the gas entrained reactant is contacted with water to wet and disentrain the reactant. The reactant and water slurry are then collected. The reactant-bearing slurry is transported to the wet scrubber for reaction therein with the SOx in the flue gas. The reactant is preferably pulverized in the entrainment chamber, with the temperature and flow rate of the flue gas being variable to permit control of the moisture content of the reactant being entrained.

**40448** **APTIC NO. 64514**

(Inventor not given.)

IMPROVEMENTS IN OR RELATING TO CATALYSTS AND TO THE USE THEREOF IN THE TREATMENT OF WASTE GASES. *(Laporte Industries Ltd., London (England)) Brit. Pat. 1,349,568. 9p., April 3, 1974. (Appl. April 19, 1971, 25 claims).*

An oxidation catalyst and a method for preparing it are presented for application to the removal of carbon monoxide, hydrocarbons, and nitrogen oxides from industrial flue gases and automotive exhausts. The preparation of the catalyst involves the following: providing aluminum oxide selected from gamma aluminum oxide, eta aluminum oxide, and aluminum oxide hydrate; separately producing calcined powdered oxide of copper and chromium selected from copper oxide in admixture with chromium oxide and copper oxide in chemical combination with chromium oxide; mixing the aluminum oxide and calcined oxide of copper and chromium; calcining the mixture; impregnating the calcined mixture with an aqueous solution of a nickel salt; and calcining the impregnated mixture at a temperature of at least 700 C to form a composition which contains aluminum oxide and from 50-90% by weight of oxide of copper, chromium, and nickel, with the nickel oxide constituting from 2-20% by weight of the composition.

**40449** **APTIC NO. 64515**

(Inventor not given.)

CATALYTIC CONVERTER FOR EXHAUST GASES OF AN INTERNAL COMBUSTION ENGINE. *(Ford Motor Co., Ltd., London (England)) Brit. Pat. 1,349,426. 4p., April 3, 1974. (Appl. May 2, 1972, 6 claims).*

A catalytic converter for either reducing nitrogen oxides or oxidizing unburned hydrocarbons and carbon monoxide in automotive exhaust gases is described which involves heating the catalyst itself to a relatively high temperature rather than raising the exhaust gas temperature as in prior art catalytic converters. An electrical heating means is provided for conductively transferring heat to at least a portion of the catalyst to improve the effectiveness of the catalyst. The catalyst is of the monolithic support type, being porous to exhaust gases.

**40450** **APTIC NO. 64518**

(Inventor not given.)

ELECTRO-STATIC PRECIPITATOR. *(Aktiebolaget Svenska Flaktfabriken, Nacka (Sweden)) Brit. Pat. 1,343,900. 8p., Jan. 16, 1974. (Appl. May 19, 1971, 10 claims).*

An electrostatic precipitator design is presented which provides a device for controlling the movement of the precipitation electrodes during cleaning so that the electrical voltage distance in the precipitator can be kept at an optimal value as opposed to prior art designs. The precipitation electrodes are placed in a number of rows parallel to the direction of gas flow, with the emission electrodes situated between the rows of precipitation electrodes. Guide means are provided on transverse bars extending perpendicular to the planes through the rows of precipitation electrodes adjacent to the entrance and exit ends to limit the perpendicular movement of the electrodes when impacted by a device for cleaning. The precipitation electrodes are also linked together in the direction of impact along the plane of each row.

**40451** **APTIC NO. 64591**

(Inventor not given.)

INTERNAL COMBUSTION ENGINE WHICH OPERATES WITH HEATING AND PRECOMPRESSION OF THE COMBUSTION AIR. *(Aktiengesellschaft Koeln-Deutz, German Federal Republic) Brit. Pat. 1,353,225. 4p., May 15, 1974. (Appl. Jan. 25, 1971, 14 claims).*

This invention provides a multi-cylinder internal combustion engine which operates with precompression of combustion air comprising an induction manifold for combustion air connected to the combustion cylinders. The manifold has enough volume to contain at least a complete charge of combustion air for the first combustion cycle of all the engine cylinders after the engine has fired, and heating means for heating the complete charge of combustion air before the engine has fired, which heating means extend over substantially the whole length of the induction manifold. The invention provides a diesel engine or other internal combustion engine that will start easily even in very cold conditions. Previous techniques employed polluted the environment due to the production of smoke containing unburnt and partially burnt fuel.

**40452** **APTIC NO. 64601**

(Inventor not given.)

METHOD OF AND APPARATUS FOR DESTROYING POLLUTANTS. *Society Anonyme Heurtey, Paris (France) Brit. Pat. 1,349,684. 7p., April 10, 1974. (Appl. April 19, 1971, 27 claims).*

A method and apparatus are described for destroying pollutants contained in a liquid in suspension, as a solution, or as a sludge. The process involves the mixing of a fuel-forming liquid or gaseous hydrocarbon with a liquid substance to form a pseudo- homogeneous mixture of at least two non-miscible phases, atomizing the mixture, and burning the atomized mixture in a combustion chamber where the developed gaseous substances are recirculated in a vortex along a path extending from a downstream axial region of the chamber towards the chamber wall, alongside the chamber wall to an upstream region, to the upstream axial region of the chamber, and towards the downstream axial region of the chamber. The reaction vessel preferably extends to an expansion chamber in which the gaseous substances are cooled and deposit part of the dust entrained into a dust collector, with provisions being made for further dust separating discharging means. The above process overcomes prior art drawbacks of large volume requirements and the necessity of obtaining a uniform temperature throughout the liquid for destruction of the pollutant.

**40453** **APTIC NO. 64604**

(Inventor not given.)

IMPROVEMENTS IN COMBUSTION EQUIPMENT. *(General Electric Co., Schenectady, New York) Brit. Pat. 1,353,335. 6p., May 15, 1974. (Appl. Aug. 27, 1971, 8 claims).*

Improvements are made in combustion equipment, particularly gas turbine engines, by reducing the temperature levels of fuel nozzles and, in doing so, minimizing the buildup of carbon and maintaining minimum smoke generation in the combustion process. Combustion equipment comprises a combustion chamber, a mixing chamber opening into the upstream end of the combustion chamber, a spray nozzle for discharging fuel in a conical spray into the mixing chamber, the axis of the spray cone extending lengthwise of the mixing chamber toward the combustion chamber, means for introducing pressurized air into the upstream end of the mixing chamber and producing an axial flow field for finely dispersing the fuel, and venturi means surrounding the spray cone. The venturi means bounds a first region through which at least a portion of the axially flowing air passes, and the venturi means is sized and positioned relative to the spray cone to define a second region extending downstream from the nozzle of an over-stoichiometric mixture of fuel and air incapable of sustaining combustion.

**40454** **APTIC NO. 64611**

(Inventor not given.)

PROCESS FOR THE COOLING AND WASHING OF GAS. *(Farbwerke Hoechst Aktiegesellschaft (Germany)) Brit. Pat. 1,343,045. 5p., Jan. 9, 1974. (Appl. April 19, 1971, 8 claims.)*

This invention relates to a process for the cooling and washing of a hot gas by means of an oil wash, providing an improved method of effecting the oil wash so that the proportion of heat which can be recovered from the gas for further utilization can be increased. It is intended primarily for use with a gas mixture obtained by the thermal cracking of hydrocarbons but is not restricted to such a mixture. The result of the cracking process depends on the final cracking temperature and the feedstock used, but when the gas mixture is intended for use in the production of acetylene and propylene, final cracking temperatures of up to 1500 C have been proposed. Before the gases are further treated, they are passed through an oil wash where the gases are cooled and most of the impurities are removed.

**40455** **APTIC NO. 64615**

(Inventor not given.)

IMPROVEMENTS IN OR RELATING TO THE PROCESSING OF COKE OVEN GAS. *(Firma Carl Still, Postfach (Germany)) Brit. Pat. 1,348,937. 4p., March 27, 1974. (Appl. Nov. 18, 1971, 9 claims).*

A method of processing coke oven gas comprises the steps of treating the gas with ammonia in gaseous, liquid, or aqueous form to form an ammoniacal liquor in which hydrogen sulfide is removed from the coke oven gas; contacting the gaseous products of the treatment with a material with which ammonia in the gaseous products reacts to form ammonium salts capable of dissociation to free at least parts of the contaminated ammonia; separating the ammonium salts so formed from the remainder of the gaseous products; and dissociating the separated salts and returning at least part of the freed ammonia for use in treating coke oven gas. The invention provides an improved method which does not require an expensive distilling process.

**40456** **APTIC NO. 64633**

Tokyo Metropolitan Government (Japan)

ON GUIDE STANDARDS FOR DISPOSAL FACILITIES OF FACTORY EMISSION GASES (HARMFUL GASES) AND COMPULSORY REQUIREMENT FOR CONTINUOUS MEASUREMENT OF QUANTITIES OF EF-

*FLUENTS IN TOKYO. (Tokyo to kojo haigasu (yugai gasu) shori shisetsu ·hido hyojun, haisuiryo renzoku sokutei no gimuka ni tsuite). Text in Japanese. Kankocho Kogai Senmon Shiryo (Public Nuisance Gaz.), 9(2):59-66, March 1974.*

The emission standards, measurement methods, and disposal processes are given for acrolein, phenol, pyridine, mercaptan, styrene, carbon monoxide, sulfur dioxide, and chlorinated sulfonic acid. For acrolein the emission standard is 5 ppm, the measurement method spectrophotometry or gas chromatography, and the disposal process a combination of the condensation method and the alkali scrubbing method. For phenol the emission standard is 50 ppm, the measurement method spectrophotometry or gas chromatography, and the control method is combustion (including catalytic oxidation) or alkali scrubbing. For pyridine the emission standard is 10 ppm, the measurement method spectrophotometry or gas chromatography, and the control method is combustion (including catalytic oxidation) or adsorption. For mercaptan the emission standards are 10 ppm, the measurement methods are the same as for acrolein, and the control methods the same as for pyridine. For styrene the emission standard is 50 ppm, the measurement method the same as for acrolein, and the control method is combustion including catalytic oxidation. For CO the emission standard is 100 ppm, the measurement method JIS K0098, and the control method is combustion (including catalytic oxidation) or ventilation. For SO2 the emission standard is 100 ppm, the measurement method is JIS K0103, and the control method is alkali scrubbing. For chlorinated sulfonic acid the emission standard is 1 mg/cu m and the measurement method is the neutralization/silver nitrate method. The five designated methods for continuous measurement of the effluents are the flume type, the dam type, the vane wheel type, the electromagnetic or pressure-sensing type, and the disc, rotor, or piston type. Their operating principles, measurement ranges, and pressure losses are listed for comparison.

**40457** **APTIC NO. 64776**

WASTE INCINERATOR AT THE BAYER COMPANY IN LEVERKUSEN. *(L impianto d incenerimento residui negli stabilimenti Nayer a Leverkusen). Text in Italian. Ing. Chim. (Milan), 23(2):8-9, 1974.*

A special waste incinerator built by Bayer AG in Leverkusen, West Germany, for the incineration of its solid, liquid, and viscous waste (many of which have high calorific value) is described. The solid wastes are crushed and incinerated in a rotary furnace at 1200 C, while liquid wastes are injected into the afterburning chamber which serves to destroy odorous gases. The flue gases leaving the afterburning chamber are cooled to 450 C in a heat exchanger, and further to 350 C in an air heater prior to being cleaned from dust in an electrostatic precipitator at 99.5% efficiency. The purified waste gases are emitted through a 100 m stack at a discharge rate of 12 m/sec.

**40458** **APTIC NO. 64950**

(Inventor not given.)

INTERNAL COMBUSTION ENGINE WITH AN EXHAUST GAS STORAGE DEVICE IN THE EXHAUST SYSTEM. *(Ford Motor Co., London (England)) Brit. Pat. 1,349,051. 4p., March 27, 1974. (Appl. May 19, 1972, 7 claims).*

This invention relates to an exhaust gas storage device in the exhaust system, intended to reduce undesirable exhaust gas emissions from an internal combustion engine during the interval between a cold start of such an engine and the time at which the catalyst in a catalytic converter has reached a predetermined temperature value. The engine comprises means for substantially evacuating the storage device at temperatures of the catalyst above the predetermined value. It further comprises a check valve connected between the converter inlet and valve means for permitting flow of exhaust gases from the storage device to the converter. The storage device includes an inflatable bladder.

**40459** **APTIC NO. 64951**

(Inventor not given.)

METHOD AND APPARATUS FOR DESULPHURIZING EXHAUST GAS. *(Hitachi, Ltd., Tokyo (Japan)) Brit. Pat. 1,347,857. 4p., Feb. 27, 1974. (Appl. July 21, 1971, 13 claims).*

A method and apparatus for removing sulfur components from the combustion gases exhausted from boilers or the like utilizing heavy oil as fuel are presented. It uses activated carbon, comprising several activated carbon packed towers, a main flue for leading the exhaust gas from a combustion apparatus into the towers, a flue branched from the main flue, means for washing the activated carbon into the towers with water to desorb the sulfur oxides contained therein, means for concentrating the resultant dilute sulfuric acid from the towers by heat exchange with part of the exhaust gas supplied thereto through the branched flue, and a flue for leading the exhaust gas from the dilute sulfuric acid concentrating means into the main flue to mix with the main exhaust gas flow before the main exhaust gas flow is admitted into the activated carbon packing towers. This invention enhances the thermal efficiency and economy of the apparatus.

**40460** **APTIC NO. 64952**

(Inventor not given.)

ELECTROSTATIC PRECIPITATORS. *(Envirotech Corp., Salt Lake City, Utah) Brit. Pat. 1,348,614. 4p., March 20, 1974 (Appl. June 8, 1972, 9 claims).*

This invention relates to an electrostatic precipitator for removing particles, for example dust particles, suspended in air or other gases. It has a housing which defines a flow chamber therein, an inlet opening for conveying a stream of particles- carrying gas into the chamber, an outlet openings for discharging the treated gas from the chamber, a particles collector hopper for receiving through a bottom opening in the chamber particles removed in operation from the gas, and a plurality of emitting and collecting electrodes extending substantially vertically through the chamber in the path of the gas stream. Corona discharge means are disposed below the emitting and collecting electrodes and above the hopper. An earthed electrode configuration is disposed below the corona discharge means. The corona discharge means and the electrode configuration provide a corona emission and an electric wind from the discharge means towards the electrode configuration when the discharge means are energized.

**40461** **APTIC NO. 64956**

(Inventor not given.)

GAS SCRUBBER. *(Fuller Co., Catasaqua, Pa.) Brit. Pat 1,348,926. 5p., March 27, 1974. (Appl. April 19, 1971, 11 claims).*

This invention provides a gas scrubber which obviates or mitigates the need for high fan speeds to build up high gas velocity and which permits the re-use of dirty scrubbing liquid without concern as to plugging of the spray nozzle through which the scrubber liquid is discharged against the dirty gas stream. The scrubber comprises a vessel having bottom, top, and side walls means dividing the vessel into two compartments, with a dirty gas inlet means in the first, a clean gas outlet means in the second, at least one open-ended gas collecting tube mounted in the dividing means and extending into at least one of the compartments, the lower portion of the second compartment below one end of the gas collecting tube defining a settling basin, at least one atomizing nozzle, means for supplying scrubbing liquid to the atomizing nozzles, and means for supplying compressed gas to the nozzles for atomizing the scrubbing liquid.

## 1973

**40462** **APTIC NO. 64558**

Acres, Gary James Keith and Barry John Cooper

PLATINUM-RHODIUM CATALYSTS FOR TREATMENT OF AUTOMOTIVE EXHAUST GASES. *(Katalysator). Text in German. (Johnson, Matthey and Co. Ltd., London (England)) W. Ger. Pat. Appl. 2,257,228. 41p., May 30, 1973. (27 claims).*

Platinum-rhodium catalysts containing preferably 7.5% Rh, supported by alumina-coated ceramics of honeycomb structure, were used for the treatment of automotive exhaust gases. Gas containing carbon monoxide 4, water (g) 5, oxygen 1-2%, 500 ppm propane, 2000 ppm nitric oxide, and balance nitrogen, passed over these catalysts at space velocity 50,000/hr, showed CO, propane, and nitrogen conversion greater than 75% at ignition temp. less than 200 C.

**40463** **APTIC NO. 64450**

Aykan, K., J. J. Mooney, R. D. Hoyer, and W. A. Mannion

DURABILITY OF MONOLITHIC AUTO EXHAUST OXIDATION CATALYSTS IN THE ABSENCE OF POISONS. *Proc. Am. Petrol. Inst., Div. Refining, vol. 53:26-38, 1973. 8 refs.*

The Clean Air Act of 1970 requires stringent emission standards for 1975, including effective control of carbon monoxide and hydrocarbons. It also requires that durability be demonstrated for 50,000 mi. One of the most promising techniques of controlling CO and HC emissions is by means of an oxidation catalyst to oxidize these compounds to harmless carbon dioxide and water. A PTX exhaust gas purifier consisting of a platinum-based monolithic oxidation catalyst was developed for use in passenger cars. A study was undertaken to determine the thermal stability, in the absence of poisons, of a modified PTX monolithic oxidation catalyst and to demonstrate its durability on a vehicle by actual road tests over 50,000 mi. The laboratory and road tests are described and discussed. When poisons were eliminated from gasolines and lubricating oils, the modified catalyst controlled emissions of HC and CO for 50,000 mi, provided that there were no system or engine malfunctions seriously overheating the catalyst. Analyses were also carried out on the lead distribution in lead-free gasolines. With 0.05 g/gal maximum lead level, less than 0.03 g/gal would be valid for certification.

**40464** **APTIC NO. 63311**

Beckman, Eldred W.

DESIGNS AND REGULATIONS. *Proc. Am Petrol. Inst., Div. Refining, vol. 53:185-198, 1973.*

The durability test results on an emission control system developed to comply with the Federal government regulations for 1975 model passenger cars are discussed. The system uses a catalytic oxidation converter. The most likely catalyst to succeed consists of palladium and platinum on a ceramic monolithic substrate material containing cordierite and mullite. The testing program is discussed. Tests included laboratory bench tests, engine dynamometer studies, chassis roll testing, road testing, coal room work, and durability testing over a wide range of operating conditions. Results are given for the proving ground durability tests. Basically, catalyst efficiency decreased with mileage. In 65% of the tests, emission control failure occurred before 15,000 miles. Projected or measured hydrocarbon and carbon monoxide emissions at 25,000 miles were generally about twice the values observed at zero miles. Catalyst mechanical durability was poor; a converter failure occurred on 50% of the cars before 25,000 miles. Current studies of catalyst loss of efficiency with mileage, catalyst durability, and meeting interim 1975 emission standards are mentioned.

**40465** **APTIC NO. 64493**

Birke, Gerhard

SCRUBBER FOR REMOVING PARTICULATE MATTER FROM GASEOUS FLUID. *(Firma W. Ernst Haas and Sohn Sinn/Dillkreis (Germany)) U. S. Pat. 3,778,982. 9p., Dec. 18, 1973. 6 refs. (Appl. May 25, 1972, 10 claims).*

A scrubber which removes particles from gaseous fluid and can be regenerated is described. A filter unit is interposed in the flow path of a stream of particle-gaseous fluid and can be rotated about an upright axis. The filter unit has a pair of vertically- spaced plates and a web of filter material surrounding an interior chamber. The gaseous fluid passes through the filter material into the interior of the chamber from which the now filtered gaseous fluid is withdrawn. The particulate matter is retained at the exterior side of the web of filter material. The filter unit can be rotated about its upright axis to thereby eject the retained particulate matter by centrifugal force from the web of filter material. Other scrubber units utilize only the flushing action of clean gaseous fluid not carrying particles. In this case, the clean gaseous fluid must be passed through the filter medium to be regenerated to impart to the filter medium a motion aiding the dislodging of the retained particles. Known scrubber units which regenerate their filter medium are expensive to construct and subject to malfunction.

**40466** **APTIC NO. 64506**

Bohm, Eberhard, Lothar Reh, Ernst We kesser, Gunter Wilde, and Gunter Winkhaus

PROCESS FOR REMOVING HYDROGEN FLUORIDE FROM GASES CONTAINING IT. *(Metallgesellschaft Aktiengesellschaft, Reuterweg (Germany) and Vereinigte Aluminiumwerke Aktien-Gesellschaft, Gerichtsweg (Germany)) Brit. Pat. 1,341,313. 8p., Dec. 19, 1973. (Appl. Nov. 12, 1971, 7 claims).*

An adsorption process for removing hydrogen fluoride from gases in electrolytic aluminum recovery plants is described which allows good absorption at relatively high gas throughputs as compared to prior art adsorption processes. The gases which contain HF are injected as a fluidizing gas into a fluidized bed reactor containing a solid adsorbent for the HF at such velocity that they cause the solids to form an expanded fluidized bed in which the solids concentration decreases upwardly and from which solids containing adsorbed HF are discharged in an upward direction due to the velocity of the gases. The solids are thereafter separated from the gases. A preferred embodiment of the process involves supplying fresh solid adsorbent continuously to the fluidized bed, with HF-containing solid adsorbent being continuously removed from the bed.

**40467** **APTIC NO. 63151**

Bracco, Frediano V.

THEORETICAL ANALYSIS OF STRATIFIED, TWO-PHASE WANKEL ENGINE COMBUSTION. *Combustion Sci. Technol., 8(1):69-84, 1973. 7 refs.*

A one-dimensional model for the spark ignition two-phase, stratified Wankel engine combustion is presented. The injected liquid fuel is assumed to break up into droplets whose vaporization and motion are computed, together with the changes of the gas phase variables, by solving a coupled system of equations made up of an appropriately simplified form of the spray equation and the conservation equations for the gas phase. The model makes use of a Weber number/Reynolds number correlation for the computation of the initial drop radius, of Stokes drag equation for the droplet motion, of a Ranz-Marshall type vaporization rate equation for the droplet vaporization, of a one-step second order reaction rate equation for the combustion of the gaseous fuel, of a turbulent diffusivity for heat and mass transfer, and of a McAdams type correlation for the wall heat transfer rate. Results are presented for a specific engine configuration. Although general conclusions cannot be derived, it would appear that the model should be valuable to the design engineer who wants to control this complex combustion problem. (Author abstract)

**40468** **APTIC NO. 63211**

Brogan, John J.

RANKINE CYCLE POWERPLANTS IN AUTOMOBILES STATUS AND PROGNOSTICATION. *Proc. Am. Petrol. Inst., Div. Refining, vol. 53:555-565, 1973.*

The status of work underway to develop Rankine cycle power plants for automobiles is summarized. Projections are made regarding the ultimate use of this type of power plant compared with other alternative systems as a replacement for conventional internal combustion engines. Particular emphasis is placed on the hardware development program sponsored by the Federal government to evaluate alternative power plants such as the Rankine cycle system. The schedule of the Rankine cycle engine development program of the Environmental Protection Agency Advanced Automotive Power Systems Program is discussed. Characteristics of the organic reciprocator, steam-reciprocator, Lear steam- turbine, and other Rankine systems using different working fluids are described. Various advantages and disadvantages of the Rankine system are mentioned.

**40469** **APTIC NO. 63357**

Burstein, Norman and Richard C. Ditzler

AIR CLEANING APPARATUS. *(Smokontrol Corp. of America, Cinnaminson, N. J.) U. S. Pat. 3,779,710. 6p., Dec. 18, 1973. 6 refs. (Appl. March 22, 1971, 4 claims).*

An improved air cleaning apparatus is described employing a precious metal catalyst for high temperature combustion of polluting vapors and using a radiant energy heat source for the catalyst. The energy is insulated from the polluted air as it moves past the catalyst by a quartz glass which surrounds the source. The catalyst is applied to a cellular refractory block which forms passages for the air. Alternatively, the catalyst is applied to glass tubes that serve as the insulating shield for a plurality of spaced heaters, with the spaces between the glass tubes serving as passages for the polluted air. The apparatus provides improved air cleaning which is efficient in its heating and energy transfer, compact in construction, practical in cost, and particularly suitable for cleaning the air in kitchens and about cooking apparatus.

**40470** **APTIC NO. 64577**

Collins, Martin F. and Romuald Michalek

CATALYTIC PURIFICATION OF WASTE GASES FROM NITRIC ACID MANUFACTURE. *(Katalytisches Verfahren zum Reinigen von schaedlichen Gasen, die Oxide des Stickstoffs und freien Sauerstoff enthalten). Text in German. (Engelhard Minerals and Chemicals Corp., Murray Hill, N. J.) W. Ger. Pat. Appl. 2,255,732. 15p., May 24, 1973. (3 claims).*

In the purification of the gases from nitrogen oxides by reduction with natural gas over palladium-alumina catalysts, an excessive temperature increase of the catalyst due to the combustion heat at high oxygen concentrations was prevented by recycling the off-gas from the reactor using a gas jet pump to decrease the O concentration. Thus, gases containing 0.152-0.2 vol% NOx and 2.7-6.0 vol% O were passed through the reactor and recycled 33.4, 60, and 100% at reactor temperatures of 421, 440, and 576 C and pressures of 6.61, 6.57, and 6.26 atm gage, respectively, to give off-gases containing 11.3, 3.6, and 1.6 ppm NOx, respectively.

**40471** **APTIC NO. 63304**

Coppoc, W. J., E. Mitchell, and M. Alperstein

A STRATIFIED CHARGE MULTIFUEL ENGINE MEETS 1976 U.S. STANDARDS. *Proc. Am. Petrol. Inst., Div. Refining, vol. 53:523-554, 1973. 11 refs.*

The Texaco Controlled-Combustion System, a stratified charge process, was first operated in 1942 and the first patent was issued in 1946. This concept utilizes a coordinated arrangement of fuel injection, positive ignition, and a high air swirl rate in the combustion chamber to yield patch burning of a combustible mixture in an overall lean fuel/air ratio. This produces excellent fuel economy, inherently low emissions of exhaust pollutants, and the ability to prevent combustion knock without regard to fuel octane or cetane number. Recent work has demonstrated the capability of the system to meet the very stringent emission levels of the 1976 Federal standards for light duty vehicles. Equally important, the potential to maintain these levels for extended periods was shown during 50,000 miles of testing. Performance, fuel economy, and drivability were good compared to other low emission concept vehicles but were poorer than the same vehicle without modification to meet exhaust emission requirements. The possibilities exist for significant conservation of crude petroleum requirements while at the same time meeting low exhaust emission requirements through the employment of this concept. The concept, performance, vehicle installation and evaluation, and engine design of naturally aspirated and turbocharged configurations of the engine are described based on results from experiments on experimental engines. (Author abstract modified)

**40472** **APTIC NO. 64616**

Coulter, Michael Oliver

REMOVAL OF MERCURY FROM GAS STREAMS. *(BP Chemicals International Ltd., London (England)). Brit. Pat. 1,336,084. 4p., Nov. 7, 1973. (Appl. Jan. 19, 1972, 11 claims).*

This invention is a process for the removal of mercury from a stream of gas containing mercury vapor by scrubbing the stream with a solution of an alkaline metal hypochlorite containing an alkali metal chloride or alkaline earth metal chloride in excess of the chemical equivalent of the alkaline earth metal hypochlorite at a pH in the range of 8 to 12. A particular advantage of this invention is that the scrubbed gas stream is not contaminated with chlorine as would be the case if acid-chlorine-containing solutions are used.

**40473** **APTIC NO. 64867**

Ditman, J. G.

SOLVENT DEASPHALTING - A VERSATILE TOOL FOR THE PREPARATION OF LUBE HYDROTREATING FEED STOCKS. *Proc. Am. Petrol. Inst., Div. Refining, vol. 53:713-723, 1973. 4 refs.*

The solvent deasphalting process is widely used for the recovery of lubricating oil and catalytic cracking feed stocks from vacuum residues. The components of lowest molecular weight and greatest paraffinicity are preferentially extracted from the residue by the use of a light hydrocarbon solvent. Data is given on the yield and quality of products obtained from the pilot plant deasphalting of seven different vacuum residues over a wide range of yields. The suitability of the products for various uses, particularly as feed stocks for lubricating oil manufacture, is discussed. The deasphalted oil contains 49% of the sulfur at 70 vol% deasphalted oil yield, 63% at 80 vol%, and 80% at 90 vol%. The percentages of nitrogen going to deasphalted oil are 34, 51, and 72, respectively. In the deasphalting of the high metal content Tia Juana residue, less than 15% of the nickel and vanadium in the residue appear in the deasphalted oil at 80 vol% deasphalted oil yield. A plant in Japan used a process for hydrotreating deasphalted oil to produce lube. Deasphalting can be used for other hydrotreating feeds. While the heavier deasphalted oils from deep deasphalting generally are not suitable for lube hydrotreating feeds as-is, they can be treated in either a gas or oil hydrodesulfurization process or in a residue desulfurization process. The products are possible feeds for lube hydrotreating where metal contents are sufficiently low. Disposal of asphaltenes by burning would produce air pollution. Asphaltenes could be sent to a partial oxidation unit to make hydrogen and a clean refinery fuel gas. A third possible outlet for asphaltenes is the manufacture of commercial asphalts. Solid asphaltenes might be used as a power plant fuel in a similar manner to pulverized coal. (Author introduction modified)

**40474** **APTIC NO. 64560**

Doerr, Karl Heinz, Hugo Grimm, Michael Tacke, Ekkehard Seitz, and Robert Peichl

REMOVAL OF SULFUR DIOXIDE FROM WASTE GASES. *(Verfahren zur Entfernung von SO2 aus Abgasen). Text in German. (Metallgesellschaft AG, Frankfurt and Sued-Chemie AG, Munich (Germany)) W. Ger. Pat. Appl. 2,158,139. 14p., May 30, 1973. (13 claims).*

Sulfur dioxide was removed from waste gases, (e.g., from the sulfuric acid manufacture by the contact process) by oxidation with absorption of the formed sulfur trioxide in 35-90% H2SO4 with 240--60 g H2S2O8/l in a venturi-shaped reactor. Dilute H2SO4 was electrolyzed for H2S2O8 formation and sprayed into the reactor and the H2SO4 formed by the SO3 absorption and H2S2O8 decomposition drawn off from the bottom of the reactor.

**40475** **APTIC NO. 64617**

Erksine, James Brian and Arthur Leslie Cude

FLARE STACKS AND STEAM/AIR MIXING DEVICES THEREFOR. *(Imperial Chemical Co., London (England)) Brit. Pat. 1,323,674. 5p., July 18, 1973. (Appl. Sept. 23, 1970, 18 claims).*

This invention relates to flare stacks and steam/air mixing devices therefor, economizing in the use of steam and reducing the speed of travel of steam from feeding points surrounding the top of the stack and so reducing the noise produced by the travelling steam. The flare stack is provided with conduits adapted to lead from at least three positions surrounding the stack, a mixture of steam and air to points directly above the stack, and at least one means to mix steam with air for feeding the said conduits which comprises a conduit end which is enlarged in diameter, a steam jet directed into the conduit end, sound deadening material within or around the enlarged conduit end, and at least one air inlet to the outlet side of the jet. In the prior art a very high steam consumption was needed and the stack tended to suck in air to the bottom of the sides of the flame at the top of the stack, causing the formation of carbon in these parts of the flame.

**40476** **APTIC NO. 64568**

Feder, Ernst and Kurt Deselaers

ONE,2-DICHLOROETHANE FROM WASTE GAS CONTAINING ETHYLENE. *(Verfahren zur Gewinnung von 1,2-Dichloroaethan aus aethylenhaltigen Abgasen). Text in German. (Dynamit Nobel AG, Troisdorf (Germany)) W. Ger. Pat. Appl. 2,156,190. 9p., May 24, 1973. (3 claims).*

Dichloroethane was recovered from ethylene-containing waste gas from CH2ClCH2Cl manufacturing by passing the waste gas through a packed reactor countercurrently with the cycling liquid CH2ClCH2Cl containing dissolved free chloride in excess. Thus, 170 cu m waste gas/hr containing 60 vol% ethylene was passed through a reactor filled with Raschig rings and contacted countercurrently with liquid CH2ClCH2Cl (87.5 metric ton/hr, 50-80 C) containing 0.35% Cl to give a waste gas containing 2.4 vol% ethylene and CH2ClCH2Cl containing 21 ppm Cl only.

**40477** **APTIC NO. 64570**

Fischer, Friedrich and Herbert Fischer

REMOVAL OF SULFUR DIOXIDE FROM GASES. *(Verfahren und Einrichtung zur Reduktion schwefeldioxidhaltiger Gase zu Elementarschwefel). Text in German. (Bamag Verfahrenstechnik, Butzbach (Germany)) W. Ger. Pat. Appl. 2,155,320. 10p., May 10, 1973. (5 claims).*

Spent activated carbon adsorbents for sulfur dioxide were regenerated by treating with quartz sand and a gaseous hydrocarbon in counterflow at 800-50 C to give a gas of 1:2 SO2-(0.5 carbon disulfide + carbon monoxide + hydrogen + carbonyl sulfide + hydrogen sulfide) ratio. This gas was passed through a sulfur separator, over an alumina-containing catalyst for the formation of S, through a S separator, and then through a reactor for combustion of the residual S to SO2, which was recycled. This process gave S in 100% yield.

**40478** **APTIC NO. 64517**

French, Albert Graham, David Edward Keast, and Terence Oven

DUST SUPPRESSION MEANS FOR MINING MACHINES. *(Coal Industry Ltd., London (England)) Brit. Pat. 1,336,791. 9p., Nov. 7, 1973. (Appl. Jan. 1, 1971, 15 claims).*

A dust suppression device for use with mining machines is described which precludes difficulties in changing the angular position of the phasing disc and dangers associated with rotating the cutting drum as experienced with prior art mining machine dust suppression devices. The device consists of a tube adapted to extend along the bore of the hollow drive shaft for feeding dust suppression fluid from the body of the machine towards the carrier, a distributor adapted to be mounted within the carrier for feeding fluid to different angular portions of the carrier, a phasing element mounted on the tube, and means to prevent the tube and phasing element from rotating but capable of being moved against the action of the resilient force to allow rotation of the tube and phasing element manually by the operator.

**40479** **APTIC NO. 63104**

Gafford, R. D. and T. A. Huls

EFFECTIVENESS OF SHORT EMISSION INSPECTION TESTS IN REDUCING EMISSIONS THROUGH MAINTENANCE. *Olson Labs., Anaheim, Calif., Environmental Protection Agency Contract 68-01-0410, Rept. EPA-460/3-73-009, 301p., July 1973. 6 refs.*

NTIS: PB 231064/AS

The conduct, methodology, and results are documented for a two-phase study designed to examine the effectiveness of short emission inspection tests in reducing emissions through maintenance. A comparison of the emission reductions and associated costs was performed for the Idle and dynamometer Loaded Steady State (LSS) inspection and maintenance regimes. The first phase of the program provided a comparison of the unloaded Idle emission inspection test plus repair industry diagnosis of mechanical malfunctions and the LSS inspection using loaded idle and two cruise modes plus repair industry diagnosis using the failure modes of hydrocarbon and carbon monoxide indicated from the inspection test. Phase II provided a comparison of the unloaded Idle emission inspection test and industry diagnosis with the LSS inspection using loaded idle and two cruise modes. A covariance test indicated that Idle and LSS were equally effective in reducing emissions in Phase I but that LSS provided statistically greater emission reductions of hydrocarbons and CO in Phase II for the total vehicle fleet. Neither Idle nor LSS resulted in statistically significant changes in nitrogen oxide emissions.

**40480** **APTIC NO. 63105**

Hall, Robert T. and G. Music

AUTOMOTIVE GAS TURBINE ECONOMIC ANALYSIS. INVESTMENT CAST TURBINE WHEEL SUPPLEMENT. *Williams Research Corp., Walled Lake, Mich., Environmental Protection Agency Contract 68-01-0405, Rept. EPA-460/9-73-001, WR-ER11, 80p., July 1973.*

A conceptual investment casting process for volume production of automotive turbine wheels is presented along with an associated cost analysis. The proposed investment casting process is based on fundamental investment casting expertise utilizing developments in fast drying binders, typical high volume production automation, and some modestly innovative production melting techniques to produce low cost turbine wheels. Adequate evidence is provided to show that volume production of automotive turbine wheels investment cast in nickel base alloys is both feasible and within the current state of the art. The cost analysis supports an original premise of an 80%-20% material to labor ratio. The original equipment manufacturer selling price per turbine wheel mass produced at the projected study levels is estimated to be approximately $10.04 to $12.15, each being dependent on alloy selection. Capitalization of a facility to investment cast 2,000,000 turbine wheels per year should cost approximately $12,000,000 to $15,000,000, depending upon alloy selection. (Author summary modified)

**40481** **APTIC NO. 63127**

Hangebrauck, Robert P.

ENGINEERING INFORMATION REQUIREMENTS FOR POLLUTION CONTROL DEMONSTRATIONS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Clean Fuels and Energy Branch, 26p., 1973 (?).*

Engineering information requirements are described for the air pollution control technology development and demonstration program of the Control Systems Laboratory of the Environmental Protection Agency. A comprehensive listing is developed for engineering information and documentation items which are normally considered and/or manifested as part of the design, construction, startup, operation, and testing of a new first-of-a- kind process. Using this data base, consideration is given to the information needs and potential process users as a basis for making independent recommendations as to the demonstration data output requirements which would be used to make a decision on installation and use of a new process control technology. Comparison of the data output requirements identified in industrial practice and demonstration projects reveals many similarities and leads to the conclusion that enough of the right kind of information is being collected.

**40482** **APTIC NO. 62997**

Hardison, Leslie Claire and James Michael Barr

CONTINUOUS CONVERSION OF NITROGEN OXIDES IN EFFLUENT GASES. *(Kontinuierliches Verfahren zur Umwandlung von Abgasstrom). Text in German. 4p., May 10, 1973. 1 ref. (Appl. Oct. 12, 1966, 2 claims).*

An effluent gas stream is led over a nitrogen oxide gas adsorbent prior to being introduced into the reducing zone in a known manner. The adsorbent adsorbs sufficient NOx at high concentrations in the effluent gas. The effluent gas stream passed into the reduction zone never contains more than 0.6 mol % of the NOx. The preferred adsorbent is particulate activated charcoal.

**40483** **APTIC NO. 62972**

Heinemann, Otto

HEAT-EXCHANGE CYCLONE FOR FINE MATERIAL AND GAS. *(Zyklon sowie Vorrichtung zum Waermeaustausch von Feingut und Gas). Text in German. (Polysius AG, Neubeckum (West Germany)) W. Ger. Pat. 2,041,585. 5p., July 12, 1973. (Appl. Aug. 21, 1970, 5 claims).*

A material/gas mixture inlet opens tangentially into the cyclone, from which clean gas flows upward through a dip tube and the fines emerge through the lower part, which consists of several successive hoppers. Preferably, the hoppers are distributed symmetrically over the cross-section, on the cylindrical part of the cyclone.

**40484** **APTIC NO. 64564**

Imris, Pavel

PURIFYING AIR AND EXHAUST GASES BY ELECTROSTATIC PRECIPITATION OF PARTICLES. *(Verfahren und Vorrichtung zur elektrostatischen Aufladung und Abscheidung von Masseteilchen, insbesondere zur Luft- und Abgasreinigung mittels metastabiler Ionen). Text in German. (Assignee not given.) W. Ger. Pat. Appl. 2,151,220. 26p. April 19, 1973. (9 claims).*

Air or gas to be purified is passed between electrodes having a high frequency pulsating d.c. voltage difference (obtained from the rectified output of a high frequency transformer), the anode of which is grounded so that a plasma of metastable ions is produced containing ions which are + and - with respect to each other but all + with respect to earth. On mixing with gas to be purified and passing to a cooler precipitating chamber, a longitudinal oscillation (which should have a frequency of 10 to the 12th to 10 to the 18th Hz) is set up between the solid particles to be precipitated and the metastable ions whereupon the solid particles become charged and precipitate on suitable electrodes. The grounded electrode in the plasma producing chamber is lined with material having a high dielectric constant. The temperature in the separation chamber is such that no visible light is produced. The electrodes in the separation chamber are vertical and are continuously bathed by a circulated layer of water which may be basic to neutralize sulfur dioxide.

**40485** **APTIC NO. 64925**

Ito, Eiichi and Akio Kamiya

STUDIES ON VEHICLE EXHAUST (I), A TRIAL OF PRACTICAL EXHAUST CONTROL DEVICES. *(Haigasu seibun ni kansuru kenkyu (I), kaniteki joka sochi ni tsuite no jikken). Text in Japanese. Nagoya-shi Kogai Kenkyushoho. (Rep. Environ. Pollut. Res. Inst., City Nagoya), no. 2:31-33, 1973. 1 ref.*

Five kinds of simple automotive exhaust control devices were compared by examining their performances. The devices employ either catalysts or the effect of combustion. The installation of catalysts reduced the amount of carbon monoxide from 7.6% to 5.1% but did not change the amount of hydrocarbons in idling, but in operation, CO was reduced from 4.1 to 2.8% and HCs from 800 to 360 ppm. Another type of catalytic device showed no improvement under idling conditions, but in operation reduced CO from 3.1 to 2.4% and HC from 680 to 560 ppm. One type of combustion device reduced the amount of CO from 7.6 to 1.5% and the amount of HC from 1000 ppm to 480 ppm at idling, and in operation, reduced CO from 4.1 to 1.4% and HC from 800 to 290 ppm. The same device installed on another car reduced CO from 7.7% to 0.8% and 1000 ppm of HC to 300 ppm in idling and 3.1% CO to 1% and 680 ppm HC to 180 ppm in operation. A second combustion device gave no improvement in either mode, and a third showed some improvement in the amount of CO but not HC. These results do not necessarily represent the decisive performance capacity of each control device, since the performance may depend on the type of car to which the devices were applied.

**40486** **APTIC NO. 63114**

Jackson, H. R., D. P. McArthur, and H. D. Simpson

CATALYTIC NOX REDUCTION STUDIES. *Preprint, Society of Automotive Engineers, Inc., New York, 7p., 1973. 18 refs. (Presented at the Society of Automotive Engineers, Automobile Engineering Meeting, Detroit, Mich., May 14-18, 1973, Paper 730568.)*

The development and evaluation of catalysts for the reduction of nitrogen oxides in engine exhausts are discussed. Hundreds of catalysts were evaluated in bench activity tests, using synthetic engine exhaust gas to determine conversion of nitric oxide to nitrogen and ammonia. Many of these catalysts were also exposed to actual engine exhaust in an engine dynamometer test, and then re-evaluated in the bench apparatus to determine the degree of catalyst deactivation. The primary causes of deactivation are sulfur and lead poisoning for catalyst prepared on nonreactive, hydrothermally stable support materials. The deactivation of a NOx catalyst from sustained exposure to engine exhaust can be closely simulated by impregnating the fresh catalyst with lead acetate to the required Pb level, followed by testing the catalyst with sulfur dioxide present in the synthetic exhaust gas. Catalysts showing high initial NOx conversion efficiency and little deactivation in engine tests were developed. (Author abstract modified)

**40487** **APTIC NO. 64566**

Jentzch, Wolfgang and Ewald Vollmerhaus

PURIFICATION OF WASTE GASES. *(Verfahren und Vorrichtung zum Abscheiden schaedlicher Gase aus Abluftgemischen hinter chemischen Produktionsstrecken). Text in German. (Badische Anilin- and Soda-Fabrik, AG, Ludwigschafen (Germany)) W. Ger. Pat. Appl. 2,153,035. 9p., May 3, 1973. (5 claims).*

Corrosive, etching, or poisonous components were removed from waste gases from chemical plants by passing successively through 2 jet pumps charged with sodium sulfite-sodium hydroxide as washing liquid and absorption in a closed separating vessel containing washing liquid of constant level maintained by circulation. A waste gas containing hydrogen chloride 0.01-100, chloride 0.01-100, hydrogen bromide 0.01-50, bromide 0.01-30, sulfur dioxide 0.05-30, sulfur trioxide 0.01-10. and ammonia less than or equal to 20 g/cu m was passed through the washing system at 5000-6000 cu m/hr using 12-15% Na2SO3-NaOH mixt. (cycling at 65 cu m/hr) as washing liquid to remove the poisonous components 98-9.8%.

**40488** **APTIC NO. 64574**

Kafes, Nicholas

RECOVERY OF HYDROGEN CHLORIDE FROM WASTE GAS. *(Wiedergewinnung von Chlorwasserstoff). Text in German. (The Lummus Co., Bloomfield, N.J.) W. Ger. Pat. Appl. 2,255,895. 21p., May 24, 1973. (8 claims).*

Hydrogen chloride was recovered from the aqueous solution of a waste gas from an oxychlorination reactor by azeotropic distillation in a 1st column at still temperature 60, bottom temperature 157 C, and 5.8 atm with injection of air as stripping gas and distillation in a 2nd column at still temperature 71 C, bottom temperature 116 C, and 1.4 atm. The head product from the 1st column (a mixture of anhydrous HCl and air) was recycled to the oxychlorination zone, the 2nd column gave nearly HCl-free water as head product. The bottom product from the 1st column was passed to the 2nd column and vice versa.

**40489** **APTIC NO. 63321**

Kaiser, F. J., P. F. Helfrey, and R. P. Vaell

RESIDFINING GOES DEEP DESULFURIZATION. *Proc. Am. Petrol. Inst. Div. Refining, vol. 53:473-487, 1973. 5 refs.*

A residuum desulfurization process called RESIDFINER is discussed with emphasis on how it effectively meets both current and projected needs for processing heavy feeds to relatively low sulfur levels. The process is based on a proprietary TR-2 catalyst which was formulated with a controlled pore sized distribution which effectively reduces deactivation due to coke and metals deposition. A Kuwait atmospheric residuum was reduced to 0.5 wt% S. A light Arabian feed was desulfurized to 0.3% S. Almost half of the total processing cost is due to hydrogen. Hydrogen requirements increase as desulfurization level is increased. At low desulfurization levels catalyst-related costs represent only 15-20% of the total processing costs. Increasing catalyst loading and operating pressure permit meeting product specificiations of 0.1% wt% S and lower. Processing costs are quite high and there is incentive to optimize process conditions to minimize the costs.

**40490** **APTIC NO. 64870**

Kitagawa, Hiroshi

ON ACTIVE CARBON: 4, AIR POLLUTION PREVENTION BY ACTIVE CARBON. *(Kasseitan ni tsuite: Sono 4, Kasseitan ni yoru taikiosen boshi). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 8(6):333-349, Nov. 1973. 66 refs.*

Desulfurization of emission gases, recovery of solvents, deodorization and air cleaning, and adsorption of mercury vapors and radioactive waste gases, all by means of active carbons, are discussed. The desulfurization processes introduced include the Reinluft process,the Hitachi-Toden process, the Sumitomo-Kanden process, the Lurgi process and the Bergbau-Forshung process, all of which are designed to remove sulfur dioxide gas by means of adsorption by active carbon. Active carbon is also used for adsorption of hydrogen sulfide. Hydrong sulfide is oxidized by the catalytic action of active carbon and the sulfur thus produced is adsorbed in pores of active carbon. Sulfur deposited in the pores of active carbon is usually extracted by ammonium sulfide water solution. The recovery process using active carbon to recover solvents gives a higher recovery rate (90% or higher) than the condensation or adsorption method. It is best suited for recovery of low-concentration solvent vapors. The recovery cost amounts to only 5-20% of the value of the solvent recovered. Solvents to be recovered by active carbon include acetone, alcohol, methylene chloride, ether, benzene, toluene, xylene, and others. The process flow sheet and equipment for the solvent recovery by active carbon are described. The formula used to calculate required thickness of active carbon layer in the adsorption column of the solvent recovery process is presented. Structures of active carbon filters and air cleaners using the active carbon filters are described. Such radioactive substances as iodine, xenon, and krypton are also removed by means of active carbon. The dilute gas holdup device using active carbon for removal of these radioactive substances in a BWR (boiling water type reactor) atomic power plant is described. Adsorption equilibrium by active carbon of krypton and xenon as well as other related characteristics are discussed.

**40491** **APTIC NO. 61591**

Kuroda, Hiroshi, Yasuo Nakajima, Kunihiko Sugihara, and Yasuo Takagi

MATHEMATICAL MODEL ANALYSIS OF NOX FORMATION IN THE CASE OF PREMIXED S. I. ENGINE. *(Math. Model ni yoru yokongo gasorin engin no NOx seiseiryo no kaiseki). Text in Japanese. Jidosha Gijutsukai Ronbunshu (Proc. Soc. Automotive Engrs.), 3(6):20-26, Nov. 1973. 14 refs.*

A mathematical model for the quantitative analysis of nitrogen oxides formation in the premixed spark ignition engine was developed based on a concept of stepped gas temperature distribution in the cylinder derived from the combination of the Zeldovich relation formula and kinetic equations. The model also involves the effects of the exhaust gas recirculation (EGR) rate, air: fuel ratio, and ignition timing. Predictions were compared with experimental data obtained from various engine operating conditions. Both results show a very close relationship. The effects of modified combustion process and fuel consumption on the supression of NOx formation are discussed in terms of the model.

**40492** **APTIC NO. 63359**

Lang, Robert J., Eugene L. Holt, and David N. Stonehack

REGENERATION OF FLUE GAS DESULFURIZATION SORBENTS. *(Esso Research and Engineering Co.) U. S. Pat. 3,778,501. 4p., Dec. 11, 1973. 4 refs. (Appl. June 4, 1971, 5 claims).*

Processes for removal of sulfur dioxide from gases such as flue gas, and processes for the regeneration of solid sorbents used in the removal of sulfur dioxide are discussed. Sulfide formation during the regeneration of flue gas desulfurization sorbents can be considerably diminished and the utilization of reducing gas markedly improved by using as the regeneration gas a mixture comprising a reducing gas and about 50 to about 95% by volume of steam. The reducing gas is either hydrogen, carbon monoxide, or a mixture thereof.

**40493** **APTIC NO. 63065**

Lapedes, D. E., L. Forrest, F. G. Ghahremani, O. Hamberg, W. U. Roessler, W. M. Smalley, M. Hinton, T. Iura, and J. Meltzer

GAS TURBINE ENGINE PRODUCTION IMPLEMENTATION STUDY. VOLUME I: EXECUTIVE SUMMARY (FINAL REPORT). *Aerospace Corp., El Segundo, Calif., Urban Programs Div., Environmental Protection Agency Contract EPA 68-01-0417, Work Unit OS314/R3531, Rept. DOT-TSC-OST- 73-26, ATR-73(7323)-1, Vol. I, 50p., July 1973.*

NTIS: PB 225465

A summarization and assessment of available information pertaining to the potential for implementing mass production of gas turbine engine-powered automobiles is presented, with schedule requirements being the main topic covered. A description of basic automotive product development phases, engine manufacturing processes, and gas turbine engine current technology status are included to permit the necessary understanding of the developed implementation schedules. A period of 8-10 yr is the best estimate of elapsed time until 300,000 gas turbine engines can be mass produced annually based on data acquired during the period February 28 to April 30, 1973. Current gas turbine engines, while demonstrating remarkably low levels of hydrocarbons and carbon monoxide emissions, still show high, unacceptable levels of nitrogen oxides. Recent steady-state tests of combustors combined with analytical studies, however, indicate that redesigned combustors with fuel prevaporization and variable geometry might be capable of meeting the 1976 Federal requirements for NOx emissions.

**40494** **APTIC NO. 62936**

LaPointe, Clayton W. and Weston L. Schultz

COMPARISON OF EMISSION INDEXES WITHIN A TURBINE COMBUSTOR OPERATED ON DIESEL FUEL OR METHANOL. *Preprint, Society of Automotive Engineers, Inc., New York, 18p., 1973. 16 refs. (Presented at the Society of Automotive Engineers Motor and Equipment Manufacturers Association Combined Commercial Vehicle Engineering Operations Power plant Meeting, Chicago, Ill., June 18-22, 1973, Paper 730669.)*

The emission index (grams of species per kilogram of fuel) field within a regenerative turbine combustor was mapped using a water- cooled sampling probe. The probe employed a choked orifice to simultaneously determine the local temperature. The following were derived from the measurements: air-fuel ratio, combustion efficiency, average fuel velocity, and fuel distribution factors. Methods of averaging the discrete data were developed. A comparison of the data obtained when the combustor was operated on each of two fuels revealed that the use of methanol leads to lower nitric oxide but higher carbon monoxide emission than does the use of diesel fuel. (Author abstract modified)

**40495** **APTIC NO. 64520**

Leas, Lawrence Earl, Robert Lamar Leas, and Cecil James Johnson

PRODUCTION OF SULPHUR-FREE GASES FROM COKE. *(Assignee not given.) Brit. Pat. 1,337,79[illegible] 2p., Nov. 21, 1973. (Appl. Jan. 12, 1971, 4 claims).*

A method for producing sulfur-free gas from sulfur-containing coke is described for use in driving turbines for more economical generation of electricity. Carbon dioxide is reacted with the sulfur-containing coke to produce a gaseous mixture of sulfur dioxide and carbon monoxide. The mixture is then reacted with cobalt oxide to produce a higher temperature CO2 and a metal sulfide. Sulfur is removed by reacting the metal sulfide with air to produce SO2 which is subsequently passed through an alcohol absorber for removal from the gases.

**40496** **APTIC NO. 63360**

Lin, Ping-Wha

AIR POLLUTION CONTROL. *(Assignee not given.) U. S. Pat. 3,781,408. 6p., Dec. 25, 1973. 7 refs. (Appl. March 16, 1972, 10 claims).*

Methods and equipments for removing sulfur dioxide, sulfur trioxide, and fly ash in combustion gases discharged as air pollutants from fossil fuel-burning, heating furnaces. The removal is accomplished by means of dust collectors and catalytic oxidation of SO2 to SO3 followed by controlled reaction of SO3 with excess lime to form CaSO4. The unspent lime, CaSO4, and collected fly ash are used together with cement for the manufacture of construction materials, the percentage of CaSO4 being carefully regulated to control the setting time of the cement. Preferably, the proportion of the excess lime is automatically regulated by process control devices designed with regard to fuel quality and requirement of the construction materials and operating according to the monitored sulfur-level of the combustion gases. The invention then removes pollutants and converts them to useful and saleable by-products, such as construction materials.

**40497** **APTIC NO. 62971**

Loquenz, Heinz, Horst Weber, and Helmut Pfisterer

VENTURI GAS SCRUBBER. *(Venturiwaescher zum Reinigen von Gasen). Text in German. (Waagner-Biro AG, Vienna (Austria)) W. Ger. Pat. 1,796,154. 4p., April 5, 1973. 9 refs. (Appl. Sept. 11, 1968, 2 claims).*

A venturi scrubber with a washing liquid overflow is described. The washing liquid feeder consists of an overflow which is arranged in the converging portion of the scrubber. The free falling liquid screen is directed towards the wall opposite the inlet. Preferably, damping plates are provided in the distributor channel.

**40498** **APTIC NO. 64572**

Mai, Gerhard, Reiner Siepmann, and Franz Kummer

CATALYSTS FOR THE REDUCTION OF NITROGEN OXIDES. *(Katalysator zur Reduktion von Stick oxiden). Text in German. (Heraeus, W. C., GmbH) W. Ger. Pat. Appl. 2,151,958. 10p., April 26, 1973. (8 claims).*

Lead-resistant catalysts were made and used for the reduction of nitrogen oxides in automobile exhaust gases. Thus, an alumina tube of honeycomb structure (vol. 21.) was impregnated with a solution containing lanthanum 4.45, nickel 0.3135, cobalt 0.3149, iron 0.2985, and rubidium 1.619 g (as nitrates) in 600 ml water and heated at 600 C in air to give a catalyst. Passing a synthetic exhaust gas containing 1200 ppm nitric oxide over the above catalyst and over the same catalyst loaded with the Pb content after 20,000 km driving gave complete reduction of nitric oxide at 250-350 and 350-550 C, respectively.

**40499** **APTIC NO. 64519**

Mare, Ernest

SCRUBBING METHODS AND APPARATUS. *(Edward L. Batemen Ltd., Transvaal Provence (South Africa)) Brit. Pat. 1,336,924. 4p., Nov. 14, 1973. (Appl. June 30, 1971, 8 claims).*

A gas scrubber is described which provides a relatively low pressure drop between the inlet and discharge openings and which consumes a minimum amount of power. The flowing stream of gas to be cleaned is divided into at least two separate streams directed along paths that are first diverging and then converging with respect to each other. The flow velocity in the converging streams is increased, and the two converging streams are intermingled in a zone located at the function of the paths converging with respect to each other. Scrubbing liquor is continuously introduced into the two streams before their intermingling.

**40500** **APTIC NO. 63144**

Mason, David M.

DECOMPOSITION OF THE OXIDES OF NITROGEN EMPLOYING A ZIRCONIA SOLID-ELECTROLYTE. *(Aposunthesis ton oxeidion tou azotou dia stereou katalutou zirkonias). Text in Greek. Tech. Chron. (Athens), no. 12:108[illegible]-1090, 1973. 17 refs. (Presented at the National Technical University of Athens.)*

Some of the applications of stabilized zirconium dioxide as a solid electrolyte developed in Europe and the U. S. are discussed. This device can be used for the decomposition of oxides of nitrogen formed by combustion. Experimental data show that an oxide is formed on the platinum catalyst which decomposes at higher temperatures and produces a clean platinum surface which catalyzes the decomposition of nitrogen oxides.

**40501** **APTIC NO. 63307**

McDonnell, T. F., R. J. McConnell, and K. Otto

FUEL CHARACTERISTICS FOR 1975-76 PASSENGER CARS AND LIGHT TRUCKS. *Proc. Am Petrol. Inst., Div. Refining, vol. 53:157-174, 1973. 10 refs.*

The deterioration of noble metal oxidation catalysts in a catalytic afterburner was studied with gasoline containing 0.03, 0.05, 0.02, and 0.10 g/gal tetraethyl lead. Three procedures were developed for catalyst durability testing: a laboratory pulse-flame reactor, a simulated EPA durability cycle, and a modified sequence V-C cycle. After durability testing, including exposure to potential catalyst poisons, four different procedures were used to measure catalyst activity: the laboratory pulse-flame reactor method, the daily catalyst efficiency check, the catalyst activity warm-up test, and the 1975 CVS-CH Federal test procedure. These tests and their results are described and discussed. Reasonable correlation of the effects of fuel lead concentration on deterioration of noble metal catalysts was obtained between field durability tests and engine dynamometer or laboratory durability tests. Some catalyst deterioration was evident at 24,000 miles with fuel containing less than 0.003 g lead/gal. A significant increase in catalyst deterioration occurred at 24,000 miles with fuels containing 0.03, 0.05, and 0.10 lead/gal relative to the less than 0.003 g lead/gal fuel. (Author conclusions modified)

**40502** **APTIC NO. 63363**

Mitchell, Edward and Martin Alperstein

TEXACO CONTROLLED-COMBUSTION SYSTEM-MULTIFUEL, EFFICIENT, CLEAN AND PRACTICAL. *Combustion Sci. Technol., 8(1):39-49, 1973. 9 refs.*

The Texaco Controlled-Combustion System, a stratified charge concept utilizing a coordinated arrangement of air swirl, fuel injection, and positive ignition, has shown, over many years of development in numerous engine conversions, excellent fuel economy, inherently low exhaust emissions, and the ability to prevent combustion knock without regard to fuel octane or cetane number. Recent work has demonstrated the capability of the system to meet the very stringent emission levels of the 1976 U. S. Federal Standards for light duty vehicles and the potential to maintain these levels during 50,000 miles of testing. The engine design and performance are described. In tests of the system using the 1975 Federal test procedure with a Texaco standard configuration, the average hydrocarbon, carbon monoxide, and nitrogen oxide emissions in g/mi were 0.36, 0.61, and 0.31, and the fuel economy was 16.2 mpg. In a test with a Texaco reduced exhaust gas recirculation, th results were, respectively, 0.48, 0.57, 0.45, and 17.6. In a test with the Environmental Protection Agency standard configuration, results were, respectively, 0.37, 0.24, 0.31, and 15.8. In a test with EPA-reduced exhaust gas recirculation, results were, respectively, 0.50, 0.14, 0.70, and 21.9. (Author abstract modified)

**40503** **APTIC NO. 63240**

Mizutani, Yukio and Satoshi Matsushita

FUEL VAPOR-SPRAY-AIR MIXTURE OPERATION OF A SPARK-IGNITION ENGINE. *Combustion Sci. Technol., 8(1):85-94, 1973. 1 ref.*

A small quantity of light diesel oil injected into the combustion chamber of a spark ignition engine running on a fuel vapor (propane)-air mixture improved the engine performances for lean mixture ratios and reduced the emissions of nitric oxide and carbon monoxide considerably. The indicated horsepower (or indicated mean effective pressure) was increased by 6 to 16% for a constant operating condition and a constant mixture ratio, while the region of stable operation was extended up to an extremely large overall air/fuel ratio greater than 20. Consequently, both the emission of NO and of CO were reduced simultaneously. The concentration of NO in the exhaust gas for the mean effective pressure of 5 kg/sq cm, for example, was reduced to 200 ppm, 1/10 of the value obtained for propane-air operation without light oil injection, while the concentration of CO was reduced down to 0.08% by volume. The effects of the injection timing and rate of light oil, and the effects of spark timing are also mentioned. (Author abstract modified)

**40504** **APTIC NO. 64684**

Mooi, J., J. P. Kuebrich, M. F. L. Johnson, and F. J. Chloupek

MODES OF DEACTIVATION OF EXHAUST PURIFICATION CATALYSTS. *Proc. Am. Petrol. Inst., Div. Refining, vol. 53:14-25, 1973.*

Factors that cause depreciation in catalyst performance were studied on two proto-type test stand engines and seven fleet cars which had been driven 10,000-13,000 mi prior to flushing, top-overhauling, and equipping with new engines and catalytic hardware. The tests were suitable to determine the mode of deactivation of platinum/ceramic monolithic exhaust purification catalysts. Poisoning from lead and phosphorus and thermal deactivation were observed in 10 catalysts from fleet and stationary engine tests. Deactivation was quantitatively related to the Pb and P content of the catalyst and the catalyst surface area. At temperatures above the normal operating range, lead interacted with the ceramic and occupied a nonpoisoning position. If a substantial amount of lead was incorporated in the ceramic, the melting point of the catalyst was reduced, and as a result, the catalyst became more susceptible to catastrophic degradation during high temperature mishaps. Thermal deactivation resulted when catalyst temperatures reached 2300 F or more. This was 600-1000 F above normal operating temperatures. Temperature excursions of this magnitude resulted from pulses of a fuel-rich mixture and were so short in duration that they were undetected by thermocouples in the exit gas stream. This deactivation mechanism involved a severe loss in pore volume and surface area. The platinum metal was hardly affected by the high temperature. (Author conclusions modified)

**40505** **APTIC NO. 62899**

Moorman, R. J. and C. H. Long

DESIGN, DEVELOPMENT AND TESTING OF A SWIRL TYPE GAS BURNER WITH FLUE GAS RECIRCULATION FOR NOX CONTROL. *Preprint, American Society of Mechanical Engineers, New York, 10p., 1973. 13 refs. (Presented at the American Society of Mechanical Engineers/ Institute of Electrical and Electronics Engineers Joint Power Generation Conference, New Orleans, La., Sept. 16-19, 1973, Paper 73-Pwr-21.)*

A swirl type gas burner was built to accommodate flue gas recirculation for nitrogen oxide control. Tests to determine the effects of recirculation on NOx emissions, flame temperature, and burner performance are reported. Recirculation caused a marked decrease in NOx emissions. Thus, because of low excess air operation and short residence time, the swirl type burner, even with heat intensity, offers good possibilities as a low NOx emission burner. This burner will also accommodate flue gas recirculation without significant effects on combustion efficiency or burner stability. (Author abstract modified)

**40506** **APTIC NO. 63322**

Mosby, J. F., G. B. Hoekstra, T. A. Kleinhenz, and J. M. Sroka

RESID ULTRAFINING. *Proc. Am. Petrol. Inst. Div. Refining, vol. 53:488-497, 1973. 4 refs.*

A proprietary desulfurization process called Resid Ultrafining which meets the demand for low sulfur heavy fuels is described. A combination of catalysts provides the activity and activity maintenance needed to ensure good performance and acceptable cycle lengths when processing heavy high metals resids. Khafji and Gach Saran resids were processed, the Khafji resid is high in S, metals, and asphaltenes while the Gach Saran is lower in S and asphaltenese but extremely high in total metals. The Khafji was desulfurized to 1.0 wt% S and West Texas was desulfurized to 0.3 wt% S. Costs depend strongly upon the feed properties and the desired product S level, but are generally in the range of $0.70 to $1.05 per barrel.

**40507** **APTIC NO. 64958**

Moss, Gerald

PROCESSES AND APPARATUS FOR COMBUSTING WHOLLY OR PARTLY, SULPHUR-CONTAINING FUEL. *(Esso Research and Engineering Co., Linden, N. J.) Brit. Pat. 1,336,563. 32p., Nov. 7, 1973. (Appl. Nov. 7, 1973, 45 claims).*

A method is provided to at least partially combust a sulfur-containing fuel to produce either a substantially sulfur-free fuel gas or stack gas. The fuel is passed to a reactor having a gas distributor at its base and containing a bed of particles comprising alkaline earth metal oxide at an elevated temperature and fluidized. The fuel is at least partially burned with oxygen in the reactor bed. Sulfur in the fuel reacts with the alkaline earth metal oxide to form solid compounds comprising S and alkaline earth metal thereby converting the fuel into a substantially sulfur-free product which leaves via the top of the reactor. Particles are transferred continuously from a first region of the fluidized bed in the reactor to a first region of a regenerator which converts some of the solid compounds to alkaline earth metal oxide with the release of the S moieties.

**40508** **APTIC NO. 62954**

Negra, John Samuel and Abe Matawan Warshaw

CATALYST CONTAINING NICKEL, COBALT AND MANGANESE. *(Katalysator zur Behandlung von Abgasen von Verbrennungsmotoren). Text in German. (Chemical Construction Corp., New York) W. Ger. Pat. Appl. 2,127,616. 4p., Sept. 20, 1973. 2 refs. (Appl. June 3, 1971, 1 claim).*

A catalyst and catalyst bed for the removal of carbon monoxide, hydrocarbons, and nitrogen oxides from vehicle exhaust gases are described. The catalyst material consists of 6 to 12 wt% nickel as equivalent nickel oxide, 1 to 5 wt% cobalt as equivalent cobalt oxide, and 0.5 to 3 wt% manganese as equivalent manganese oxide on a carrier (alpha-alumina, silica, or magnesia). The catalyst material is prepared by impregnation of the support material by the nitrates of the above metals. Catalyst beds prepared from such catalyst material are designed for operating temperatures of 300-800 C. It is possible to place two catalyst beds in series with air admitted between the two beds.

**40509** **APTIC NO. 63256**

Newton, Larry R. and Ralph Fernandez

DUST COLLECTION FOR BAGASSE-FIRED BOILERS. *Hawaii. Sugar Technol., 1973:99-109, Nov. 1973.*

Practical and financially sound methods of controlling air pollution problems in the operation of all bagasse-fired boilers are discussed. Bagasse-fired boilers dispose of sugar cane stock and provide a source of steam and power. They represent a source of 3600-4200 Btu/lb as fired or 7000-8500 Btu/lb of dry bagasse. The fuel itself does not produce pollution but requires an auxiliary fuel which does produce pollution. The use of bagasse as a source of fuel saves on the cost of transportation and eliminates a solid waste problem. Mechanical collectors can be used to clean fly ash and dust loadings of 1-6 grains/standard cu ft in a size range of 5-30% minus 10 micron. Single stage multitubular dust collectors can obtain efficiency from 62-92% depending on particle size, specific gravity, and dust loading. Two stage mechanical collectors are usually 4-5% more efficient than a single stage collector. Fractionating collectors consist of a high efficiency secondary mechanical collector operating at 3.5-4 in. of water or a Turbulaire low energy scrubber operating at 5-8 in. of water. The gas leaving the scrubber contains water vapor well above the dew point which eliminates the normal scrubber steam plume. Combinational mechanical collectors and wet scrubbers in series can also be used to solve pollution problems from bagasse boilers. Test results of a Turbulaire scrubber are described. When operating properly, the scrubber can reduce dust emissions to 0.5 gr/scf, or an operating efficiency of 97.5% or better. The design criteria of mechanical collectors are described.

**40510** **APTIC NO. 64528**

Nicklin, Thomas

RECOVERY OF SULPHUR FROM GASES. *(British Gas Corp., London (England)) Brit. Pat. 1,340,067. 4p., Dec. 5, 1973. (Appl. Aug. 25, 1971, 6 claims).*

A process is described for the production of sulfur from a gaseous mixture containing hydrogen sulfide and sulfur dioxide. The process involves contacting the gaseous mixture in a reactor vessel with a catalyst consisting of oxides of nickel and molybdenum, whereby H2S and SO2 are reacted together to yield sulfur. The nickel and molybdenum oxides are preferably disposed on a catalyst carrier of bauxite, corundum, or active alumina. The catalyst preferably contains 2-3% of nickel oxide and 6-7% of molybdenum oxide based on the weight of the metals in relation to the total weight of the catalyst including carrier.

**40511** **APTIC NO. 63355**

Nicksic, Stephen W. and Shigeto Suzuki

H2S REMOVAL. *(Chevron Research Co., San Francisco, Calif.) U. S. Pat. 3,777,010. 3p., Dec. 4, 1973. 5 refs. (Appl. June 21, 1971, 6 claims).*

A process is provided for removing hydrogen sulfide from a gas mixture containing H2S and for the production of sulfur. This process comprises contacting the gas mixture with a solution, prepared by mixing 100 parts of an H2S solvent with 0.05 to 5.0 parts of an amine, to absorb H2S from the gas mixture, and oxidizing H2S absorbed in the solution to sulfur by contacting the solution containing H2S with a gas comprizing molecular oxygen. Preferably the gas mixture from which the H2S is removed is a mixture of H2S and light hydrocarbon gases. Preferred amine additives are alkyl nitrogen compounds such as dimethylamine. Preferred H2S solvents include dimethyl foramide. The invention is based on the finding that when using fresh dimethyl formamide, H2S removal efficiency was less than about 90%, whereas when an amine was added the efficiency increased to about 99%.

**40512** **APTIC NO. 64607**

Nielssen, Eric

CATALYSTS - LOOKING FOR THE FORMULA. *Autocar, vol. 138:4-7, Feb. 22, 1973.*

A review of the status of catalytic converter research, particularly by General Motors and Questor Corp., is presented along with a discussion on the emission requirements for cold starts and the importance of the availability of low lead or lead-free gasoline. The newest catalytic converter systems can be grouped into 4 categories: single-bed oxidizing systems, using a catalyst with a rich-running engine to oxidize unburned hydrocarbons and carbon monoxide; single-bed reducing systems, using thermal reactors to burn excess HC and CO and a reducing catalytic bed to deal with nitrogen oxides which are inherently low as a result of proper engine tuning for a rich mixture; single-bed oxidizing and reducing which performs both functions with a single catalyst if the air/fuel ratio is held within very close limits; and dual bed oxidizing and reducing systems, using two distinct and separate catalyst beds in sequence to detoxify the exhaust gas. The last type of system is the functional method of the General Motors Triple Mode Emission Control System which is diagrammatically displayed and discussed. Test data for the Questor Reverter, a single-bed type system, are given and emissions amount to 0.07 g/mi for HC, 2.8 g/mi for CO, and 0.25 g/mi for NOx.

**40513** **APTIC NO. 63345**

Niepoth, G. W.

EMISSION CONTROL SYSTEM REQUIREMENTS OF THE 1975-1976 CARS. *Proc. Am. Petrol. Inst., Div. Refining, vol. 53:175-184, 1973.*

Development of advanced emission control systems has been aimed toward meeting the 1975 and 1976 Federal exhaust emission requirements. The limits for 1975 are 1.5 g/mi hydrocarbons, 15 g/mi carbon monoxide, and 3.1 g/mi nitrogen oxides; the limits for 1976 are .41, 3.4, and .4 g/mi, respectively. Several emission control systems are discussed including an oxidizing catalytic converter/improved carburetor and choke/exhaust gas recirculation/air injection/quick heat intake manifold/electronic high energy ignition/positive crankcake ventilation/evaporation control combined system, a manifold catalytic converter, and a dual catalytic converter. The first system meets the 1975 standards, the second is below 1973 standards and somewhat higher than 1975 standards, and the third meets 1976 standards. Results of a high mileage test of 32 experimental cars showed deterioration in the catalytic converter emission control. Changes in certification procedures have been suggested so that only the average, rather than all, cars must meet the NOx requirement. The emission durability test results on NOx catalysts showed no catalyst which could give the required emission control capability at extended mileage. Defeat devices which would degrade emission control under conditions other than the Federal emission test and proposals for evaluation of emission control hardware under conditions other than the Federal test cycle are discussed. It is proposed tha present standards are too high, and new standards should be set using the Federal test procedure of 1 g/mi HC, 18 g/mi CO, and 1.5 g/mi NOx which would give required air quality.

**40514** **APTIC NO. 64959**

Ninomiya, Jack Sado

COMBUSTION ENGINE EXHAUST SILENCER AND PARTICLE SEPARATOR. *(Ford Motor Co., London (England)) Brit. Pat. 1,336,453. 4p., Nov. 7, 1973. (Appl. April 19, 1971, 7 claims).*

This invention relates to an exhaust silencer for muffling the sound of and removing particles from the exhaust of a combustion engine. It comprises: an elongated housing having an inlet at one end for connection to the engine and an outlet at the other end communicating with the atmosphere; a plurality of partitions dividing the interior of the housing into a plurality of chambers, each partition having an orifice or orifices therein to permit exhaust flow between the chambers on each side of the partition, thy partitions being arranged so that the exhaust gases are conducted sequentially through the chambers, the orifices in the partitions becoming progressively smaller from the inlet end to the outlet end; and a baffle located in each chamber which deflects the exhaust stream entering that chamber via the orifice or orifices to remove particles carried by the exhaust stream, each of the chambers removing particles of a size which differs from the sizes removed by the other chambers at a particular engine speed.

**40515** **APTIC NO. 63060**

Notych, A. G., V. V. Mosiashvili, Y. G. Strel chenko, N. I. Globa, L. N. Tyutyunnik, and B. D. Kotlyar

OPTIMIZATION OF DUST EXTRACTION ON THE SLAG POCKETS OF OPEN-HEARTH FURNACES. *(K voprosu optimizatsii pyleulavlivaniya v shlakovikakh martenovskikh oechey). Text in Russian. Izv. Vysshikh Uchebn. Zavedenii, Chernaya Met., no. 5:39-42, 1973. 4 refs.*

Dust extraction on the slag pockets of open-hearth furnaces was optimized by studying the motion of the dust and gas flow. The slag pockets combined gravitational and inertial dust separation, and the development of cyclone properties was essential for increasing the dust-separating efficiency of slag pockets. Tangential admission of the gas flow into the slag pocket and optimization of the particle trajectory were necessary for increased separation efficiency.

**40516** **APTIC NO. 64565**

Okuyama, Toshiki, Mitsuyoshi Sano, Shinichi Manabe, Hiroko Iwabuchi, Junichi Mine, and Mikiko Sato

CATALYSTS FOR EXHAUST GAS TREATMENT. *(Katalytische Zusammensetzung zur Behandlung von Abgasen und Verfahren zu ihrer Herstellung). Text in German. (Nissan Motor Co., Ltd., Yokohama (Japan)) W. Ger. Pat. Appl. 2,252,402. 35p., May 30, 1973. (22 claims).*

Alumina-supported catalysts for the treatment of automotive exhaust gases contained nickel oxide and chromium oxide, with optional partial replacement by oxides of manganese, copper, zinc, or iron, and 4-5 mole% zirconium (with respect to the total metal content) as Zr oxide. Thus, alpha-$Al_2O_3$ was impregnated with an aqueous solution containing the nitrates of Ni, Mn, Cr, and Zr, dried 15 hr at 120 C, and sintered 3 hr in air at 700 C to give a catalyst containing Ni 1.0, Cr 0.5, Mn 0.5, and Zr 0.1 M as oxides. Gas containing carbon monoxide 2.0, carbon dioxide 12.0, oxygen 2.5 vol%, 500 ppm propane, 1000 ppm nitric oxide and balance nitrogen was passed over this catalyst in a 5000-km test a initially 410 C and finally 480 C to give NO conversion 90% with $NH_3$ formation 100-20 ppm vs. more than 700 ppm for similar catalysts containing no Zr oxide.

**40517** **APTIC NO. 63351**

Opkerkuch, Robert E., Jr. and Michael G. Konicek

GAS PURIFICATION. *(Monsanto Research Corp., St. Louis, Mo.) U. S. Pat. 3,781,413. 3p., Dec. 25, 1973. 6 refs. (Appl. Oct. 27, 1971, 6 claims).*

Sulfur dioxide and hydrogen sulfide are removed from a gas containing either one, or both with one in stoichiometric excess of the other, by the reaction of $SO_2$ and $H_2S$ in the presence of sulfuric acid. Application of this reaction for gas purification, especially flue gases, had been limited by the necessity to cool the flue gas prior to the reaction in aqueous media and subsequently reheat the flue gas prior to its discharge to the atmosphere providing buoyancy and flue control. Thus it is desirable to treat the flue gas at elevated temperatures to avoid substantial reheating of the gas after treatment. For example, flue gas treatment in the presence of sulfuric acid solutions is possible at temperatures above 200 F, and preferably above the melting point of sulfur. By selecting the proper concentration of sulfuric acid solution, the water balance between the hot entering gas and the acid solution is maintained without the necessity of significantly cooling the entering gas.

**40518** **APTIC NO. 64941**

Ozawa, Minoru

METHOD OF DISPOSING NITROGEN OXIDES IN FLUE GAS FROM NITRIC ACID TREATMENT. *(Shosan shori haigaduchu no chisso sankabutsu no shoriho). Text in Japanese. Proc. Environmental Conservation Engineering Study Group (Japan), Semin. Meas., Attenuation, Removal Nitrogen Oxides Combust. Gas, Osaka, Japan, 1973. p. 165-179. (Nov. 8-9.)*

Nitrogen oxides treatment equipment utilizing catalytic oxidation and absorption is described. The equipment is installed at more than 10 establishments and is presently used only for exhaust gas treatment from chemical processes and is operated with final concentration in the range of 50-150 ppm. The NOx concentration produced in the process of dissolving metals in nitric acid and mixed hydrochloric or sulfuric acids exceeds 1% and even 10% when the reactor is sealed. In the preliminary treatment, the NOx concentration is reduced to less than 2000 ppm by washing. Then, the exhaust gas is heated, mixed with a suitable amount of steam, passed through a catalytic layer for oxidation, and absorbed in an alkali solution. The operational procedures are described with flow diagrams. The nitric oxide is oxidized to nitrogen dioxide which is more readily absorbed in alkali solutions, and the NO2/NO value calculated from the equilibrium constant is 200,000 at 25 C. The catalysts used are alumina, silica, activated charcoal, and metallic oxide catalysts. The metallic oxide carried on the activated charcoal could be used as long as 1 yr with the supplement of only 1-2%. The contact time varies with the flow rate of gas, but generally 1-2 sec of contant is sufficient. The addition of more than 5% steam is needed to attain a NOx removal rate of more than 90%. The removal rate is reduced when the oxygen concentration is less than 4%, particularly at 1-2%. The alkali solution concentration varies with NO2 concentration, however, the use of about 3% solutions is adequate and the removal rate is reduced at concentrations higher than 15%.

**40519** **APTIC NO. 64595**

Puri, Balwant Rai, Om P. Mahajan, and Shayam S. Bhardwaj

DISPOSAL OF SULPHUR DIOXIDE BY THE USE OF ADSORBENT CARBONS. *Chem. Ind., no. 10:483, May 19, 1973.*

Passing sulfur dioxide-nitrogen mixtures (1:15 by volume) at a flow rate of 2 l/hr over 5 g sugar charcoal heated electrically to a desired temperature removes SO2 to increasing extents with increasing temperature above 300 C. The optimum temperature for the disposal of the gas is 600 C. Data are tabulated for results obtained with various adsorbent carbons including sugar and coconut charcoals, two carbon blacks, a commercial sample of activated carbon, and a sample of soft coke, all ground to pass 100 mesh. Between 91.6 and 97.4% of the SO2 can be disposed of with sugar or coconut charcoal when led over a 5 g charcoal bed for 2 hrs. Carbon blacks are much less effective, being about the same as soft coke; the cause of the lower efficiency appears to lie in the material s lower capacity to fix sulfur which in turn may be attributed to lower concentrations of unsaturated sites in the materials.

**40520** **APTIC NO. 63343**

Reed, Robert D., John Smith Zink, Robert E. Schwartz, Horst Glomm, John C. Corble, and Harold F. Koons

METHOD AND APPARATUS FOR NON-POLLUTING COMBUSTION OF WASTE GASES. *(John Zinc Co., Tulsa, Okla.) U. S. Pat. 3,779,689. 9p., Dec. 19, 1973. 6 refs. (Appl. Jan. 10, 1972, 14 claims).*

A flare or disposal systems for waste gas utilizing a low-level ground burning system which is substantially smokeless, noiseless, and non-polluting to the atmosphere, is described. The system includes a low-level burner adapted to handle the usual volumes of plant waste gas, required to be disposed, without visible flame, smoke, or noise pollution. An elevated flare can be used in combination to consume gases in excess of the normal capacity of the low-level flare. Some prior systems have plural burner stages which operate sequentially upon reaching a given pressure but have the disadvantage of each stage starting at zero and these systems do not operate efficiently and economically.

**40521** **APTIC NO. 64562**

Reh, Lothar, Karl Vydra, Karl-Heinz Doerr, Hugo Grimm, and Karl- Heinz Hennenberger

CATALYTIC OXIDATION OF SULFUR DIOXIDE. *(Verfahren zur katalytischen Umsetzung von Gasen mit hohem Gehalt an SO2). Text in German. (Metallgesellschaft AG, Frankfurt and Norddeutsche Affinerie, Hamburg (Germany)) W. Ger. Pat. Appl. 2,213,578. 5p., Oct. 11, 1973. (10 claims).*

A gas containing 15-60 vol% of sulfur dioxide is catalytically oxidized to sulfur trioxide in stages. The amount by volume of SO2 in the gas is 1.6-1.9 times the amount of oxygen. The gas remains in every stage for 0.03-0.5 sec, preferably 0.05-3.0 sec, and the catalyst is in particle form, preferably spheres, with a surface area/volume ratio of 200-300 m. The preferred method is in two stages using a vanadium pentoxide catalyst in the first stage, and iron catalyst in the second.

**40522** **APTIC NO. 63202**

Reilly, J. W., M. C. Sze, U. Saranto, and U. Schmidt

JET FUELS AND SOLVENTS VIA LUMMUS AROSAT. *Proc. Am. Petrol. Inst., Div. Refining, vol. 53:123-128, 1973. 2 refs.*

The steadily increasing demand for low aromatic content solvents and jet fuel stimulated the development of the Lummus Arosat process. The objective of this process is the reduction of the aromatic contents of these petroleum products to extremely low levels by means of highly efficient and economical hydrogenation. The major incentive for the development of these solvents and jet fuel is the demand for reduced air pollution. The Arosat process consists of a mixed phase, single reactor system designed to maximize hydrogen utilization while minimizing product aromatics content and costs. A noble metal catalyst is employed to provide long catalyst life and to minimize sensitivity to common feedstock contaminants such as sulfur compounds and entrained water. The commercial operation at the Naantali refinery of Neste Oy in Finland is described. Three feedstocks are processed by desulfurization and then the Arosat process. The feedstocks are a narrow-boiling hexane solvent, a white spirit similar to the diluent used in paints, varnishes, and lacquer, and a straight-run jet kerosene fraction.

**40523** **APTIC NO. 64567**

Renault, Phillipe, Andre Deschamps, and Claude Dezael

REMOVAL OF SULFUR DIOXIDE AND HYDROGEN SULFIDE FROM WASTE GASES. *(Verfahren zur Reinigung von Schwefligsaeureanhydrid oder Schwefelwasserstoff enthaltendem Industrieabgas mit gleichzeitiger Gewinnung von elementarem Schwefel). Text in German. (Institut Francais du Petrole des Carburants et Lubrifiants, Rueil- Malmaison (Germany)) W. Ger. Pat. Appl. 2,249,253. 11p., April 19, 1973. (5 claims).*

Sulfur dioxide or hydrogen sulfide were absorbed from waste gases with aqueous sodium carbonate at 60 C, the solution treated with carbon dioxide and ammonia at 30-5 C for precipitation of sodium bicarbonate, the filtrate evaporated, and the formed gas containing CO2, NH3, and SO2 or H2S treated with H2S or SO2, respectively, in the presence of polyethylene glycol of mol. wt. 400 at 130-50 C to give S. The NaHCO3 ppt was calcined to give CO2 and Na2CO3, which were recycled. The off-gas from the S formation containing CO2 and NH3 was also recycled.

**40524** **APTIC NO. 63203**

Roeder, R. A.

HYDROTREATING CATALYST CAPABILITIES--DESULFURIZATION OF NAPHTHAS AND FURNACE OILS. *Proc. Am. Petrol. Inst., Div. Refining, vol. 53:146-155, 1973. 4 refs.*

The desulfurization capabilities of Cyanamid hydrotreating catalysts when processing naphthas and furnace oil feedstocks are discussed. Emphasis is placed on naphtha desulfurization required for multimetallic reformer feedstocks and furnace oil desulfurization required to meet 0.1-0.2% sulfur restrictions on Number Two heating oil. Existing Cyanamid catalysts provide less than 1 ppm product sulfur levels at typical naphtha process conditions and at economical space velocities. There may be activity differences for some hydrotreating catalysts which the refiner may take advantage of by carefully seeking the minimum start-of-run temperature required for 1 ppm product sulfur levels. The effects of various changes in process conditions on furnace oil desulfurization are shown for Cyanamid catalysts. Product sulfur levels in the 0.1-0.2% range were obtained on two 1.4% sulfur furnace oil blends. Similar furnace oil feedstocks have significantly different degrees of desulfurization difficulty. (Author abstract)

**40525** **APTIC NO. 53353**

Ross, Samuel Scott

EXHAUST CLEANER. *U. S. Pat. 3,778,981. 9p., Dec. 18, 1973. 5 refs. (Appl. March 21, 1973, 3 claims).*

A low pressure exhaust cleaner using a scrubber employing a liquid vapor dispensing means to provide maximum saturation for separating extremely particulate aerosols is described. The steam scrubber is in communication with a source of particulate aerosols through a duct which is disposed at a tangent to the lower portion of the steam scrubber. A dependently mounted steam conduit is supplied with steam under pressure from a suitable source having a plurality of exit holes. Condensed water and particulates are discharged through the holes at the lowermost terminal end of the cone-shaped walls. A heat exhaust duct discharges heated gases and the like into a suitable exhaust stack. The liquid vapor dispensing element of the scrubber and the pressure flow of particulate bearing gases are relatively low. The scrubber does not inhibit the flow of exhaust gases from a production apparatus and does not inherently require gas propelling blowers or turbines.

**40526** **APTIC NO. 64494**

Rudd, Alexander H., John H. Kidwell, and Thomas J. Murray

REDUCING NOX FORMATION BY COMBUSTION. *(Babcock and Wilcox Co., New York) U. S. Pat. 3,781,162. 6p., Dec. 25, 1973. 3 refs. (Appl. March 24, 1972, 8 claims).*

A system for controlling the combustion of fuel so as to minimize the formation of nitrogen oxides during combustion is described which overcomes prior art problems of poor mixing of recirculated flue gases by mixing such gases with combustion air upstream of the point of fuel introduction into a boiler combustion chamber. A restriction in the air supply duct such as a venturi or one or more air foils is provided to measure the combusion air flow to the combustion chamber. Recirculated gases are added downstream of the air flow restriction (in an airflow sense) to minimize the pressure and thus power required by the recirculated gas fan and to insure intimate mixing of the recirculated gases with the combustion air.

**40527** **APTIC NO. 62995**

Schabert, Robert

FILTER PADS. *(Filtermatte). Text in German. (Assignee not given.) W. Ger. Pat. 1,507,802. 4p., March 29, 1973. 4 refs. (Appl. April 30, 1966, 3 claims).*

Dust filter pads for an air filtration plant are described based on plastic fiber wadding. The wadding is of a carded material, especially acetyl-cellulose or polyster fibers. After manufacture, each individual fiber is given an adhesive coating by impregnating the wadding with a solution of that adhesive in an organic solvent, expressing the excess by rolling and drying at 100 C. The adhesive is one that remains tacky after the solvent has been dried out. The first material specified for adhesive is an acrylic ester in a 20:80 solution of trichlorethylene. Before impregnation, the wadding has a specific gravity of 0.07-0.5; it is a bulky material; and the dry weight take up is 250-400 g/sq m. The drying temperature is 135 C.

**40528** **APTIC NO. 64559**

Semel, Georg V., Eduard Schibilla, and Wolfgang Strewe

POTASSIUM SULFATE RECOVERY IN THE PURIFICATION OF SULFUR DIOXIDE- CONTAINING WASTE GASES. *(Verfahren zur Reinigung von $SO_2$- haltigen Abgasen). Text in German. (Friedrich Uhde GmbH, Dortmund (Germany)) W. Ger. Pat. Appl. 2,147,427. 7p., March 29, 1973. (3 claims).*

The waste gases from a power plant containing nitrogen, carbon monoxide, and carbon dioxide contaminated with sulfur dioxide are freed from $SO_2$ by washing with a potassium hydroxide and potassium chloride solution obtained as waste liquor from a diaphragm electrolytic plant. The potassium sulfite formed in the countercurrent washing process is oxidized by air or oxygen- enriched air at 50-100 C/3-24 atm and KCl is added to the oxidized solution to lower the solubility of potassium sulfate. The $K_2SO_4$ is filtered off and the filtrate is recycled to the electrolytic plant after its KCl content has been increased to 250-350 g/l.

**40529** **APTIC NO. 64668**

Shibata, Tsutomu

TREATMENT OF EXHAUST GAS FROM RESIN COATED SAND MOULDING IN FOUNDRY SHOP. *(Chuzo kojo no sheru haigasu shori). Text in Japanese. Shinto Giho (Shinto Tech. Rep.), no. 4:31-39, May 1973.*

Phenol, formaldehyde, and ammonia are major components of disagreeable odors emanating from foundries. Concentrations of these compounds in the foundry atmosphere were determined by taking set volumes of air samples and shaking up these samples vigorously with predetermined volumes of absorption agent. The resultant liquid samples were analyzed. The maximum concentrations in ppm were: phenol, 6000; $NH_3$, 450; formaldehyde, 5-10. A wet absorption process for treating exhaust gases is described. By means of blowers, the gases were forced through an absorption tower where the gases were absorbed at layered steel trays studded with holds in which rested glass spheres having a larger diameter than that of the holes. For apparent wind velocities up to 4 m/s, pressure loss was 45-70 mm/Aq. Absorption equations for this new design tower are presented. The waste water from the tower was then treated with a combination of Hyperclear chemicals, or passed through activated charcoal. Phenol concentrations were undetectable after either treatment. The COD (chemical oxygen demand) concentrations were reduced to 20 ppm with the Hyperclear treatment.

**40530** **APTIC NO. 63305**

Steele, D. M., G. D. Gould, R. R. Roselius, and W. M. Haunschild

CLEAN FUELS THROUGH NEW ISOMAX TECHNOLOGY. *Proc. Am Petrol. Inst., Div. Refining, vol. 53:450-463, 1973. 5 refs.*

The increasing demand for energy, and the increasing restrictions on sulfur dioxide emissions from power plants and industries are generally reviewed. The most promising method for controlling emissions from high-sulfur fuel oil is to desulfurize the oil, rather than to try to remove $SO_2$ from the stack gas by scrubbing or other methods. A program to develop new technology and new catalysts to reduce the costs of VGO Isomax plants for the treatment of vacuum gas oils is discussed. Significant trends in recent applications of the VGO Isomax process are large single-train plants with capacity of 60,000 B/D or more in one reactor, greater desulfurization of the fuel (0.05-0.1% sulfur in the 350 F product), lower design pressures (600-800 psig), and designs for long-operation cycles (3 years instead of 1 year betwee catalyst regeneration). Text work on making premium quality charge stocks from Middle East crude, producing light distillate fuels, reducing sulfur levels at a given processing cost, shifting to a hydrocracking type of catalyst and a higher pressure once-through design, and reducing sulfur to very low levels by solvent deasphalting and gasification of the high-sulfur SDA tar and VRDS Isomax followed by delayed coking of the VRDS bottoms product are mentioned. These last two methods of producing 0.05% sulfur heavy fuel oil are described in detail. The economics of the two processes are presented.

**40531** **APTIC NO. 64571**

Strong, Herbert W., Henry A. Cook, and Jerrold E. Radway

REMOVAL OF SULFUR DIOXIDE FROM FLUE GASES. *(Verfahren zur Abtrennung von Schwefeldioxid aus Gasen und zur Gewinnung von elementarem Schwefel hieraus). Text in German. (Basic Inc., Cleveland, Ohio) W. Ger. Pat. Appl. 2,258,442. 41p., June 7, 1973. (19 claims).*

Sulfur dioxide was removed from flue gas with conversion into sulfur by absorption in calcium sulfide or sodium sulfide solution at pH 3.5-4.5, extension of the S formed by evaporation or leaching with carbon disulfide, and optional reduction of residual calcium sulfite and calcium sulfate with coal to CaS, which was recycled to the absorption solution. Thus, fly ash-free flue gas was passed through CaS at 60-80 C and pH 3.5-4.5, 10% of the obtained slurry was filtered, the residue calcined at 600 C to convert CaS2O3 into CaSO3 and S, and CaSO3 into CaSO4 and CaS, and to evaporate S, which was condensed in 90% yield. The residue was reduced at 850 C to give CaS, which was recycled.

**40532** **APTIC NO. 64849**

Takechi, Hideo, Kiyotaka Senba, Kiyoshi Higaki, and Shigeyoshi Kurosaka

STUDY ON THE CHEMICAL REMOVAL APPARATUS OF SULPHATE INCLUDED IN STACK GAS OF MANUFACTURES (PART 2). *(Haien datsuryu sochi no kenkuy (dainiho). Text in Japanese. Ehime-ken Sogo Kagaku Gijutsu Shidosho Kenkyu Hokoku (Rep. Ehime Prefect. Gen. Chem. Technol. Guid. Off.), no 11:7-9, May 1973. 2 refs.*

Two types of desulfurization apparatus for stack gas were investigated. A desulfurization apparatus with two packed towers, using as absorbent an aqueous solution of more than 3% sodium hydroxide reduced the concentration of sulfur dioxide to less than 50 ppm. Using an aqueous solution of 0.3-1.0% NaOH, it was possible to reduce the concentration to 100-300ppm. However, using water as the absorbent it was impossible to reduce the concentration to below 300 ppm. In a desulfurization apparatus with only one packed tower, it was possible to reduce the concentration to below 50 ppm using an aqueous solution of 0.5% NaOH. The liquid flux required for a tower packed with stainless steel was less than 1/10 of the flux for an ordinary tower.

**40533** **APTIC NO. 63201**

Taylor, Herman, Jr.

COMMERCIAL DEVELOPMENT OF HDS GULF HDS PROCESS. *Proc. Am. Petrol. Inst., Div. Refining, vol. 53:464-472, 1973. 5 refs.*

Gulf s Residual Hydrodesulfurization (HDS) Process is described. The process uses a rugged catalyst which produces the product sulfur level desired, is tolerant to the deposition of metals, does not consume hydrogen in unnecessary side reactions, maintains good selectivity while avoiding deactivating coke deposits, and is available worldwide at a reasonable price. The catalyst comprises as active components, Group VI and VIII metals. Precise pilot plant work and sound process design were combined with proper metallurgy and equipment to result in a unit whose performance and capability equaled that of the catalyst. The commercial units using this process are discussed. Because the 1.0% sulfur level in fuel oil may no longer be adequate in many areas, research is continuing on variations of the Gulf HDS Process to produce lower sulfur content. These variations and their costs are reviewed.

**40534** **APTIC NO. 62932**

Tekelly, Dorothy M. General Motors Research Labs., Warren, Mich,. System on Automotive Safety Information

ROTARY COMBUSTION ENGINES: A SELECTED BIBLIOGRAPHY. *SASI 73-494, 47p., June 1973. 685 refs.*

A rotary combustion engine bibliography of 685 references is presented. It is a revised and amended edition of an earlier bibliography, The Wankel Engine: A Selected Bibliography 1960-1970, Feb. 1971. The citations are arranged alphabetically by author, there is no index.

**40535** **APTIC NO. 62974**

Uffelmann, Rolf and Wilhelm Schuster

AIR DEODORIZER. *(Desodorierungsmittel fuer Luft). Text in German. (Herzog and Langen GmbH, Xanten (West Germany)) W. Ger. Pat. 1,492,372. 4p., Feb. 8, 1973. 5 refs. (Appl. Dec. 6, 1963, 1 claim).*

Air can be deodorized with an absorbent mixture of 1:2 to 2:1 glycerin and alky aryl sulfonate, respectively. A filter made of jute fibers and wire mesh with a surface of 2 sq m and a thickness of 10 cm soaked with 20 l of the deodorant can be used for a month for deodorizing 4000 cu m/hr air drawn off from a horn meal factory.

**40536** **APTIC NO. 62990**

Vivian, J. Edward

ABSORPTION OF SO2 INTO LIME SLURRIES: ABSORPTION RATES AND KINETICS. *Massachusetts Inst. of Technology, Cambridge, Dept. of Chemical Engineering Environmental Protection Agency Contract 68-02-0018, Task 4, ROAP 21ADE-21, Program Element 1AB013, Rept. EPA-650/2-73-047, 61p., Dec. 1973. 9 refs.*

NTIS: PB230936/AS

The absorption of sulfur dioxide from an SO2-nitrogen gas mixture into water and lime solutions and slurries was studied in a short wetted wall column at approximately one atmosphere and 25 C. The mole percent of SO2 in the gas was varied from 0.03 to 0.37. The system appeared to be gas absorption accompanied by an infinitely rapid irreversible second-order reaction in the liquid phase when solutions of calcium hydroxide greater than 0.01 g mole/l and slurries were used; in water the system appeared to be gas absorption accompanied by a fast reversible hydrolysis reaction in the liquid phase. The only effect of the solid in the slurries was to increase the absorption capacity. The major resistance to gas absorption at the concentration levels studied was in the gas phase, and at the lowest concentrations studied the system was gas phase controlled. (Author abstract modified)

**40537** **APTIC NO. 63062**

Voltz, Sterling E., Charles R. Morgan, David Liederman, and Solomon M. Jacob

KINETIC STUDY OF CARBON MONOXIDE AND PROPYLENE OXIDATION ON PLATINUM CATALYSTS. *Ind. Eng. Chem. Prod. Res. Develop., 12(4):294-301, 1973. 18 refs. (Presented at the American Chemical Society, National Meeting, 165th, Dallas, Tex., April 1973.)*

The kinetics of carbon monoxide and propylene oxidation on a platinum-alumina catalyst were determined with synthetic gas mixtures between 400 and 700 F. The results were used to formulate a system of reaction rate equations and to evaluate the key kinetic parameters. The rates of oxidation increased with increasing oxygen concentration and decreased by carbon monoxide, propylene, and nitric oxide. Both the experimental results from the synthetic gas mixtures and the predictions of the kinetic model agreed favorably with the observed oxidation rates of CO and hydrocarbons in real engine exhausts. Complex kinetic equations were formulated, and some rate constants and activation energies were calculated. The kinetic model was also successfully applied to aged pelleted platinum-alumina and fresh platinum monolithic catalysts for use in automotive emission control systems. (Author abstract modified)

**40538** **APTIC NO. 64861**

Wagner, T. O. and L. W. Russum

OPTIMUM OCTANE NUMBER FOR UNLEADED GASOLINE. *Proc. Am. Petrol. Inst., Div. Refining, vol. 53:39-58, 1973. 4 refs.*

When use of lead antiknock compounds is permitted in quantities up to 4 g/gal, gasoline cost/mi to motorists is lowest at approximately 98 research octane number. At this quality, called the optimum octane number, benefits in mileage from raising octane number just match the increased price of the higher-quality gasoline. To determine what octane quality will be needed in the 1980s, when unleaded gasoline will be used for cars manufactured after 1974 or 1975, the economics of gasoline refining was studied. The optimum octane number was determined by a five-step process: definition of vehicle efficiency in terms of compression ratio; definition of vehicle octane requirements in terms of compression ratio; elimination of compression ratio by combining the relations for mileage and octane number; estimation of gasoline costs in terms of octane number; and comparison of vehicle mileage and costs to motorists to find the optimum octane number. The study concluded that there are economic incentives to increase motor octane number of unleaded gasoline above the value of 82 now specified for ASTM Grade 2. While the exact value depends on individual refining situation, it appears that the optimum pool octane number is at least 85, and likely to be close to the 87 motor octane rating. At any pool octane number, the best utilization of quality is achieved with multiple octane grades. An unleaded premium gasoline of octane quality approximating ASTM Grade 4 should be marketed as well as Grade 2 to yield substantial economic benefits if higher-requirement engines are produced. Octane demands of unleaded gasolines are partly offset by the declining sales of leaded premium gasoline as older cars are retired; of course, demand for unleaded gasolines develops only gradually as new cars are introduced. To produce higher octane unleaded gasoline, the petroleum industry must construct additional processing facilities. (Author conclusions modified)

**40539** **APTIC NO. 63308**

Watkins, C. H., R. J. Parker, and J. M. Pharis

DESULFURIZATION OF KUWAIT REDUCED CRUDE TO 0.3% SULFUR CONTENT. *Proc. Am. Petrol. Inst., Div. Refining, vol. 53:498-505, 1973. 3 refs.*

Residual fuel oil desulfurization is reviewed, stressing the increasing stringency of the environmental standards. Residual desulfurization is reviewed at two severity levels: the first represents present sulfur restrictions in many large cities; the second, showing the present sulfur limit for a few congested urban areas, is projected as a general requirement for most U. S. cities in the near future. A commercial operation to 1.0 wt% sulfur product is discussed and compared to a pilot plant operation using a modified flow scheme to produce 0.3 wt% sulfur product. These processes are based on the Isomax removal of sulfur from fuel oil. Since fuel oils of 0.3 wt% sulfur content can be produced from relatively low metal reduced crudes which constitute a large portion of the world s export crude oils, direct desulfurization by RCD Isomax provides a method for meeting the most severe sulfur restrictions planned for the U. S. The economics of desulfurizing Kuwait reduced crude oil are discussed. (Author abstract modified)

**40540** **APTIC NO. 64529**

Weber, Rainer Jorg

INTERNAL COMBUSTION ENGINE EXHAUST GAS EMISSION CONTROL APPARATUS. *(General Motors Corp., Detroit, Mich.) Brit. Pat. 1,338,733. 4p., Nov. 28, 1973. (Appl. Feb. 10, 1972, 4 claims).*

A catalytic converter for automotive emission control is described which permits the use of relatively cheap catalysts by cooling of the exhaust gases once the engine has reached normal operating temperature. The operation of the cooling unit is such that it is controllable in accordance with the operating temperature of the engine. The cooling unit is situated in the exhaust conduit between the engine and the catalytic converter. The exhaust gases pass into the catalytic converter substantially uncooled when the exhaust gases are still relatively cold during starting of the engine.

**40541** **APTIC NO. 62985**

Yavorsky, P. M., S. Akhtar, and S. Freidman

COAL GASIFICATION: CONVERTING COAL INTO NON-POLLUTING FUEL OIL. *Chem. Eng. Progr., 69(3):51-52, March 1973.*

A one step hydrodesulfurization process is described for coal conversion into non-polluting fuel oil. The novel feature of the one step process is the use of rapid, turbulent flow of hydrogen to propel coal slurry through an immobilized bed of catalyst pellets in a reactor. The slurry vehicle for conveying the coal is a recycled portion of its own product oil. The combined effect of the hydrogen, turbulence, and catalyst is to liquefy and desulfurize the coal at high yields and high throughput. Sulfur is removed as hydrogen disulfide which is easily converted into inert elemental sulfur for industry and storage.

**40542** **APTIC NO. 63106**

Radian Corp., Austin, Tex.

FACTORS AFFECTING ABILITY TO RETROFIT FLUE GAS DESULFURIZATION SYSTEMS (FINAL REPORT). *Environmental Protection Agency Contract 68-02-0046, Rept. EPA-450/3-74-015, 68p., Dec. 1973. 10 refs.*

NTIS: PB 232376/AS

Results are presented from a study of factors affecting ability to retrofit flue gas desulfurization systems to steam-electric power plants in Ohio and the rate at which systems may be installed. Factors affecting the rate of application of desulfurization systems include: capability and willingness of vendors to supply the systems, time requirements, labor availability, lead-time, equipment delivery, and availability of capital and engineering construction services. Ground space for equipment in proximity to the boiler and stack is a key factor. Flue gas desulfurization process economics and cost estimates are presented showing how major factors including equipment requirements, plant load factor, plant operating life, mode of solid waste disposal, and byproduct revenues affect costs. The report focuses on lime and limestone but also considers magnesium oxide and sodium-based scrubbing processes.

**40543** **APTIC NO. 64502**

(Inventor not given.)

REACTOR FOR PURIFICATION OF EXHAUST GASES FROM AN INTERNAL COMBUSTION ENGINE. *(Toyo Kogyo Co., Ltd., Hiroshima-Ken (Japan)) Brit. Pat. 1,341,854. 5p., Dec. 28, 1973. (Appl. Jan. 13, 1971, 7 claims).*

A reactor for purification of internal combustion engine exhaust gases is described which reduces the stresses of the inner shell associated with devices of this type of accomodating the heat expansion of the shell. The reactor consists of an inner shell defining a reaction chamber, an outer shell surrounding the inner shell and defining a heat insulating space, and inlet and outlet conduits. The inlet and outlet conduits include pipes arranged at right angles to one another, with the inner shell being mounted, by way of one of the pipes, for movement relative to the outer shell in a direction parallel to the axis of the pipe and for movement relative to the outer shell in directions both parallel and normal to the axis of axes of the pipe or pipes.

**40544** **APTIC NO. 64527**

(Inventor not given.)

RECOVERY OF SULFUR DIOXIDE. *(United States Atomic Energy Commission, Washington, D. C.) Brit. Pat. 1,341,174. 3p., Dec. 19, 1973. (Appl. April 4, 1972, 5 claims).*

A process for sulfur dioxide recovery from stack gases is described in which a new type of cycle is utilized to recover sulfur values in the process of SO2 absorption. Gas containing SO2 and excess oxygen is passed through a bed of reactive uranium oxide which absorbs the SO2 present in the process gas. Regeneration of the UO2 bed is then accomplished by passing sulfur vapor through the bed to reduce the bed material to UO2. The sulfur supplied to the bed during regeneration is recovered in the form of SO2 which may be used or sold to recover the cost of the reductant, something which has not been attained in prior processes relying on metal oxide absorption of SO2.

**40545** **APTIC NO. 64530**

(Inventor not given.)

METHOD OF PURIFYING EXHAUST GASES CONTAINING CARBON MONOXIDE. *(Mitsui Mining and Smelting Co., Ltd., Tokyo (Japan)) Brit. Pat. 1,339,559. 10p., Dec. 5, 1973. (Appl. Dec. 11, 1970, 19 claims).*

A catalytic oxidation method of purifying stack gases and automotive exhaust gases of carbon monoxide is described in which a catalytic composition is used which overcomes prior art problems associated with catalyst deterioration and sensitivity to temperature. The gas to be purified is subjected to the simultaneous action of oxygen and a catalyst at elevated temperature, with the catalyst consisting of one or more free oxides of manganese, one or more free oxides of lead, and optionally a third component selected from oxides of alkaline earth metals, transition metals, rare earth metals, silicon dioxide, aluminum oxide, metallic aluminum, copper, or iron. A preferred method is given for preparing a pellet type catalyst of the above composition which retains its shape even under severe conditions.

**40546** **APTIC NO. 64531**

(Inventor not given.)

METHOD AND DEVICE FOR THE PURIFICATION OF FLUE GASES. *(Oy Tampella Ab, Tampere (Finland)) Brit. Pat. 1,337,849. 3p., Nov. 21, 1973.t (Appl. April 19, 1971, 8 claims).*

A method for purifying flue gases is described which in addition to separating particulate matter from the gases also provides for convenient disposal of the separated matter. The flue gases are passed through an elongate chamber having at least one lower region defining a melt basin. The chamber is shaped to deflect the flue gases towards the melt basin and is maintained at a temperature sufficient to at least partially melt particles entrained in the flue gases to thereby cause a significant increase in the density of the particles which then separate by inertia from the flue gases and form a molten bath in the melt basin.

**40547** **APTIC NO. 64868**

Kansai Electric Power Co., Inc. (Japan)

POWER COMPANIES WRESTLING WITH ENVIRONMENTAL PROTECTION--ITS PRESENT STATE AND COUNTERMEASURES. *(Kankyo hozen ni torikumu denryoku kakusha -- genjo to taisaku). Text in Japanese. Denki Kyokai Zasshi (J. Japan Electric Assoc.), 601(11):10-32, Nov. 1973.*

The Kansai Electric Power Inc. has proceeded with the development of dry and wet type flue gas desulfurization facilities, the use of lower sulfur fuels (such as switching class B heavy oil into class A), the direct combustion of crude oil, and the introduction of liquefied natural gas (LNG). For the dry type flue gas desulfurization facility, a 62.5 MW test plant was constructed in 1972 at the No. 8 plant of the Sakaiko Power Plant, following the construction of a 3000 kw pilot plant at the No. 2 Himeji power plant in 1968, and the test operation was finished in Jan. 1973. In the case of the wet type, on the basis of results obtained from a 5400 N cu m/hr capacity of a lime scrubbing pilot plant at No. 1 plant of Amagasaki power plant, a 35,000 KW lime-gypsum plant was constructed in 1972 at the No. 2 plant of Amagasaki Higashi Power Plant, and the test operation was finished with good results. Installation of this type of desulfurization facility is also planned for the Osaka and Nankai Power Plants. A desulfurization method by gasification is being studied jointly with Idemitsu Kosan Co., and two-stage combustion and the flue gas mixing method will be incorporated in large scale boilers as a nitrogen oxides reduction measure. A denitrization facility is planned jointly with Hitachi, Ltd. at the Sakaiko Power Plant. This facility is expected to exhibit a high denitrization efficiency because several kinds of catalysts suitable for flue gas containing less nitrogen oxides and are not deactivated by sulfur dioxide are used.

**40548** **APTIC NO. 64960**

(Inventor not given.)

A CATALYTIC CONVERTER FOR A MOTOR VEHICLE ENGINE EXHAUST SYSTEM. *(Nissan Motor Co., Ltd., Yokohama (Japan)) Brit. Pat. 1,335,727. 6p., Oct. 31, 1973. (Appl. Dec. 15, 1971, 9 claims).*

A catalytic converter for use with an exhaust system of a motor vehicle is described. It comprises: a container having inlet and outlet openings for communication respectively with upstream and downstream parts of the exhaust system; and a catalyst bed accommodated in the container to define a chamber, the chamber having an inlet for introduction of secondary air, the catalyst bed having therein at least one first passage having one open end communicating with the inlet opening and another open end communicating with the chamber and having at least one second passage sharing a common wall. The first passage has one open end communicating with the chamber and another open end communicating with the outlet opening. A surface defining each of the first and second passages carries a catalyst material. Prior art systems fail to meet practical requirements in construction and performance characteristics, due to their large size.

**40549** **APTIC NO. 64961**

(Inventor not given.)

IMPROVEMENTS IN FILTERS FOR SEPARATING DUST FROM AIR. *(Asbestos Grading Equipment Co. (South Africa) (Proprietary) Ltd., Johannesburg)) Brit. Pat. 1,336,523. 4p., Nov. 7, 1973. (Appl. May 1, 1972, 5 claims).*

This invention relates to filters for separating dust from air. It comprises a casing, a separating wall in the casing to provide a lower filter chamber and an upper plenum chamber for the passage of cleansed air, a series of filter bags disposed in one or more circular rows within the filter chamber and which communicate with the plenum chamber via orifices in the separating wall, a blower means, and at least one tubular rotary arm in the plenum chamber arranged to sweep over the orifices in the separating wall and to convey blasts of cleansed air from the blower means sequentially into the filter bags via the orifices to dislodge dust particles trapped on the outer surfaces of the filter bags. There is a receiving chamber within the filter chamber for receiving incoming dust-laden air which comprises an inner zone surrounded by the filter chamber and is provided with an inlet duct arranged for dust-laden air to enter substantially tangentially into the receiving chamber and an outlet for dust-laden air to pass from the receiving chamber into the filter chamber.

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**40550** **APTIC NO. 64771**

Burke, Richard J.

CLEANING OF FILTERS USING VORTEX RINGS. *(California Portland Cement Co., Los Angeles, Calif.) U. S. Pat. 3,685,257. 5p., Aug. 22, 1972. 6 refs. (Appl. May 13, 1970, 21 claims).*

This invention provides for the application of vortex rings to filters, such as bags, for cleaning purposes. The filter structure is cleaned by generating gas flow in a traveling vortex ring, and directing ring travel into particulate cleaning relation with that structure. It provides a method and means to promote mixing of particulate and the fluid entraining it, proximate a filter zone, through usage of vortex rings, for more efficient filtering.

**40551** **APTIC NO. 62996**

Cathers, GGeorge Ivan and William Eston Shockley

REMOVAL OF ORGANIC AND INORGANIC IODINE FROM THE ATMOSPHERE. *(Entfernung von organischem und anorganischem Jod aus einer Gasatmosphaere). Text in German. (Atomic Energy Commission, Washington, D. C.) W. Ger. Pat. Appl. 2,241,816. 8p., Aug. 25, 1972. (5 claims).*

Iodine, inorganic iodine compounds, and organic iodine compounds can be removed from the air by treatment with nitric acid under conditions preventing iodine volatilization. Thus, methyl iodide was removed by passing 10 air/min through refluxing 15.4-16 M HNO3 at 120 deg, with cooling water of 35-55 deg, and with the gas off-flow passed through a silver zeolite later at 200 deg to give a decontamination factor of 5.7 times 10 to the 5th power. An optional second reflux condenser was operated at less than or equal to 15 deg.

**40552** **APTIC NO. 63044**

Clark, Dennis E.

CONTROLLING RESPIRATORY DUST AT SHANNON BRANCH MINE. *Coal Age, 77(12):83-85, Dec. 1972.*

Results are presented from an underground coal mine program designed to achieve operation at or below a respirable dust level of 2.0 mg/cu m. Roadways were a major source of respiratory dust due to the high friability of the coal, and all coal transfer points were dust sources. As much as one pound of dust per shift was measured as being generated from a belt feeder. It was found necessary to keep all sprays on the continuous miner in operation to keep down dust, with the line curtain being a minimum of 5 ft from the operators. Two primary ventilation factors located were: dust concentration was lower with the line curtain and face returns on the left side of the places and splitting or fishtailing air gave two air courses to a panel, reducing respiratory dust concentration to the crew to approximately 30% of a single split panel. The data obtained indicated that the mine can operate and maintain the 2.0 mg standard under its controlled testing program.

**40553** **APTIC NO. 64770**

Coons, William R., Jr., Gerald V. Nelson, and Glenn C. Wray

DESULFURIZATION OF RESIDUE-CONTAINING HYDROCARBON OILS. *(Texaco, Inc., New York) U. S. Pat. 3,686,095. 4p., Aug. 22, 1972. 4 refs. (Appl. Feb. 16, 1970, 9 claims).*

Hydrodesulfurization of atmospheric residua or vacuum residua is carried out with a catalyst containing a compound of a Group VI metal and a compound of an iron group metal with a catalyst support of alumina, zirconia, or magnesia containing 2-14% silica and having specified surface area, pore volume and average pore diameter. The prior art comprises contacting the sulfur-containing charge stock with a catalyst in the presence of hydrogen at elevated temperatures and pressures to convert the sulfur present in the charge stock to hydrogen sulfide. Ordinarily the hydrogen-rich effluent gas is subjected to a hydrogen sulfide removal treatment and recycled to the reaction zone. Typical catalysts comprise cobalt and molybdenum, nickel and molybdenum, or nickel and tungsten on a support such as alumina. (Author abstract modified)

**40554** **APTIC NO. 62991**

Cosgrove, Lee Albert and James Edward McEvoy

CATALYSTS FOR AUTOMOBILE EXHAUST GASES. *(Katalysator fuer Kraftfahrzeug-Abgase). Text in German. (Air Products and Chemicals Inc., Allentown, Pa.) W. Ger. Pat. Appl. 2,247,740. 11p., Sept. 29, 1972. (4 claims).*

Catalysts containing 6-18% manganese oxide, 2.9-6% chromium oxide, and 0.1-0.2% palladium on alumina were made by impregnation of alumina with the corresponding metal salts and by heating at 400-800 deg to decompose the salts. Thus, Al2O3 spheroids were impregnated with a solution containing manganese nitrate, ammonium chromate, and palladium nitrate, and were heated at 400 deg to give a catalyst containing 9.4% MnO, 3.4% Cr2O3, and 0.1% Pd. This catalyst was used for the combustion of exhaust gases at 437 deg; the addition of 5% air decreased the carbon monoxide, hydrocarbon, and nitrogen content by 91, 71, and 9%, respectively.

**40555** **APTIC NO. 62994**

Deschamps, Andre, Claude Dezael, and Philippe Renault

REMOVAL OF SULFUR DIOXIDE FROM FLUE GAS. *(Verfahren zur Eliminierung von Schwefeldioxid in Industrieabgasen). Text in German. (Inst. Francais du Petrole des Carburants et Lubrifiants, Paris (France)) W. Ger. Pat. Appl. 2,235,124. 12p., July 18, 1972. (6 claims).*

Flue gas containing 0.2% sulfur dioxide, 12% carbon dioxide, 12% water, and 75.8% nitrogen was treated with an ammonium sulfite solution at 50 deg to give a waste gas containing 120 ppm SO2 and a sulfite solution of ammonium bisulfite-ammonium sulfite and water-sulfite molar ratios of 1:1 and 9:1, respectively. This solution was partially recycled and partially contacted with hydrogen sulfide at 50 deg to give an ammonium thiosulfate solution which was evaporated at 100-30 deg. The thiosulffate was decomposed at 300 deg to give liquid sulfur and SO2 containing gases, which were contacted with H2S and polyethylene glycol of a molecular weight of 400 at 140 deg to give liquid S and gases containing ammonia. The gases were condensed and recycled to the SO2 absorption phase. The sulfur was removed to be used as a saleable by-product.

**40556** **APTIC NO. 62943**

Hirata, Hiroshi

THE JAPANESE SULPHUR SITUATION POLLUTION CONTROL TRIGGERS OFF A SULPHUR SURPLUS. *Sulphur, no. 100:39-44, May/June 1972.*

The relationship between the control of sulfur oxides emissions and the supply of sulfur in Japan is discussed. The current sulfur supply trend is toward recovery of S as a by-product from SOx emissions. Most of the fuel oil used in Japan is rich in S and future recovery of S by-products is estimated at 3 million tons. Prices of S and sulfur acid have dropped sharply and additional ways are being searched to utilize the excess S. The desulfurization of fuel oil will not in itself suffice in view of the growing concern over pollution. The installation of flue gas desulfurization units and oil gasification plants are necessary. There are some processes for removing sulfur dioxide from flue gas that seem well tested, e.g., the sodium sulfite process patented by Kureha Chemical Co., but the limited scope of the domestic market for sodium sulfite makes further application of this process unlikely. Desulfurization processes must give rise to recovery of the S values as elemental S, H2SO4, or gypsum. These are in an overabundant supply already, but there is a greater potential market for these products than there is for sodium sulfite.

**40557** **APTIC NO. 63058**

Hubmer, Hermann

MAINTENANCE-FREE WASTE GAS FILTER. *(Verfahren und Einrichtung zur Reinigung von Abluft). Text in German. (Assignee not given.) W. Ger. Pat. Appl. 2,248,256. 6p., Oct. 2, 1972. (2 claims).*

Waste gases are filtered by humidified substrates which are passed continuously or intermittently through the filter zone by a conveyor or by gravity. On 1 kg humus, 4-8 l sulfur dioxide is absorbed and converted to sulfuric acid. Through addition of ammonia, lime, slag, or other alkaline matter to the humidified substrate which was loaded with pollutants, it is neutralized and can be used as a soil improvement agent. The humidifed substrate is obtained from peat, humus, or compost to which biologically active material, e.g., strains of bacteria, is added. The substrate enters the divided filter shaft at the top at a rate which matches the rate of discharge at the bottom. The pollutant-laden air enters at two points on top of the filter and passes through the substrate to a hollow space from where it is drawn off. The filter substrate can also be pressed down between perforated hollow tubes by the polluted air with the aid of a blower.

**40558** **APTIC NO. 62942**

Hulewicz, Z.

RELATIONSHIP BETWEEN AEROSOL PARTICLE DEPOSITION FACTORS AND AEROSOL STREAM CONCENTRATION BY WEIGHT IN SCRUBBERS. *(Zaleznosc wspolczynnikow osadzania czastek aerozolu od koncentracji strumienia aerozolu w procesie filtracji skruberowej). Air Conserv. (English translation from Polish of: Ochrona Powietrza), 6(5): 27-37, 1972. 2 refs.*

The relationship between aerosol particle deposition factors and aerosol stream concentration by weight in a scrubber was investigated. The summary factor for aerosol particle depositon in the porous course of a countercurrent scrubber was split analytically into the three componential factors corresponding to the inertial and diffusive mechanisms and capture. Graphs are presented showing the relationship between the inertial factors of aerosol particle deposition in a scrubber with filling and concentration of the aerosol stream; the effect of aerosol stream concentration and Reynolds number on the diffusion factors of aerosol particle deposition; and the relation between the factor of aerosol particle deposition by way of capture and concentration.

**40559** **APTIC NO. 64438**

Katsuhara, Jun

STUDIES ON THE RELATIONS BETWEEN CHEMICAL STRUCTURE AND OLFACTORY MASKING EFFECT OF ODORIFEROUS SUBSTANCES. *(Akushu ni taisuru masukinguzai no koka to kagaku kozo). Text in Japanese. Koryo (Aromatics), no. 102:25-28, Aug. 1972. 10 refs.*

To see the relationship between the masking effect and the chemical structure of bad odor elements, nine masking agents were introduced to three odor elements and the change of threshold values was tested on three members of a sensitivity test panel. The three odor elements were trimethylamine, ethylmercaptan, and dimethyldisulfide. Masking agents were 1,8-cineol, ethyl caproate, menthone, limonen, n-propyl alcohol, and toluene, which were obtained from a store and distilled for refining. Each masking agent was diluted by ethanol and was injected into a test chamber which was heated at 160 C. The odor was carried by the carrier gas (air) flowing at 300 ml/min and smelled through the nosepiece of Olfacto Mechanica, a test device designed by the author and his collagues. The masking effects of the chemicals varied greatly. No masking effect was noted on dimethyldisulfide. The order of masking effect was constant, and for any of the bad odor elements, 1,8 cineol gave the best result. The value of carbon number affected the masking mechanism, and carbon frame also had some effect. Those molecules with large volume, such as camphor, cineol, carene, and pinen, with spherical molecules, had a better masking effect, depending to some extent on the functional radicals. Generally, high polarity among C10 gave better masking effects.

**40560** **APTIC NO. 63072**

Kearby, Kenneth K., Harold N. Miller, Anantha K. S. Raman, and Joseph Vardi

CATALYTIC CONVERSION OF EXHAUST GAS IMPURITIES. *(Esso Research and Engineering Co., Linden, N. J.) Brit. Pat. 1,262,318. 6p., Feb. 2, 1972. (Appl. March 24, 1969, 12 claims).*

A catalytic conversion method is described for the reduction of automobile exhaust gas pollutants. The exhaust gases are contacted, without adding external oxygen to the exhaust stream, at temperatures over 800 F with an unsupported catalyst bed or packing consisting of nickel and copper or nickel, chromium, an/ iron or reduction of the nitrogen oxides. The exhaust gases containing reduced NOx may be optionally contacted with oxygen or air which is added to the exhaust stream to oxidize carbon monoxide and unburned hydrocarbons. The oxidation is preferably performed in the presence of a second unsupported catalyst at a temperature over 800 F.

**40561** **APTIC NO. 64463**

Kressley, Leonard J.

SELF-LEVELING GRATELESS STACK GAS SCRUBBER. *(Assignee not given.) U. S. Pat. 3,685,262. 4p., Aug. 22, 1972. 6 refs. (Appl. May 25, 1970, 2 claims).*

An apparatus for scrubbing stack gas has been invented in which particulate solids may be readily and economically contacted with a stack gas to remove various undesirable components from the stack gas, with the inexpensive recovery of spent solids for sale or use in other operations. The construction of the chamber allows self-levelling of the solids and continuous flow of particulate solids and gases without grates or agitation. The chamber has a plate on the inside which extends downwardly such that a space is formed below the plate. The plate has a gas exit formed by the space below. (Author abstract)

**40562** **APTIC NO. 62966**

Lang, Ludwig

IMPROVEMENTS RELATING TO THE DETOXICATION OF EXHAUST GASES OF INTERNAL COMBUSTION ENGINES. *(Aerolyt-Vertriebsgesellschaft fuer Abgasentgiftungsgeraete mbH, Baden-Baden (West Germany)) Brit. Pat. 1,266,504. 4p., March 8, 1972. (Appl. Feb. 9, 1971, 10 claims).*

An apparatus is described for removing toxic components from the exhaust of internal combustion engines by catalytic oxidation in two series-connected devices. The first device is located in the exhaust manifold or in the immediate vicinity of the exhaust manifold in advance of the exhaust pipe and the second device, a silencer. By this location, the catalytic oxidation works with a bypass action. Previous catalytic afterburners did not have the bypass action, which was uneconomical.

The bypass action is where from a predetermined speed of the engine or the travelling speed of the automobile, the exhaust gas and air mixture is bypassed around the catalyst material. A bypass action considerably increases the life of the catalyst compound.

**40563** **APTIC NO. 64462**

McIlvaine, Robert L. and Roger E. Kent

WET SCRUBBER FOR CONTAMINATED GAS. *(Environeering, Inc., Skokie, Ill.) U. S. Pat. 3,685,261. 7p., Aug. 22, 1972. 4 refs. (Appl. Feb. 16, 1971, 6 claims).*

The invention relates to wet gas scrubbers of the gas-liquid contact type wherein a contaminant collecting scrubbing liquid is introduced into a high velocity gas flow for collection and removal of contaminant particles and fumes in the gas. A plurality of spaced-apart parallel liquid troughs are provided to extend transversely across the flow passage, and each of the troughs is concave in cross section for holding liquid. The underside of each trough defines a deflecting wall portion for venturilike, convergent-divergent gas passage and a cover is spaced above each trough having an upwardly concave cross section with an upper surface also defining a wall portion of a venturilike gas passage. Adjacent pairs of troughs and their covers define convergent-divergent flow passages therebetween having minimum area throat sections adjacent the space between a trough and its cover. Liquid is introduced in the throat section from the trough into the high velocity gas flow by venturi suction. (Author abstract)

**40564** **APTIC NO. 64475**

Meacham, George B. K. and James L. Oliver

EMISSION CONTROL DEVICE. *(Assignee not given.) U. S. Pat. 3,685,499. 8p., Aug. 22, 1972. 8 refs. (Appl. Sept. 16, 1970, 10 claims).*

This invention relates to a mechanism for causing relative rotation between first and second members while torque is being continuously transmitted between the two members and, in particular, to a hydraulic mechanism for advancing or retarding the phase relationship of an engine camshaft relative to a driving camshaft. While prior devices are able to vary the phase relationship between the camshaft and the crankshaft, the devices do not permit variations of the phase relationship with sufficient accuracy to insure precise control over the adjustment of the camshaft to permit maximum reduction in the emission of noxious exhaust gases. In the present invention, a driven member is secured in fixed relationship to the camshaft and is connected through a helical ball spline to a piston member which is nonrotatably rotated to the crankshaft. The piston member and the driven member define a fluid chamber therebetween. A shiftable valve member permits flow of fluid to the chamber causing the piston to move axially relative to the driven member, whereby the helical ball spline causes the driven member to rotate relative to the piston, which in turn causes rotation of the camshaft relative to the crankshaft. The valve member may be controlled either manually or automatically in response to an engine operating condition. (Author abstract modified)

**40565** **APTIC NO. 63059**

Meyers, Robert Allen

PYRITIC SULFUR REMOVAL FROM COAL USING SOLUTIONS CONTAINING FERRIC IONS. *(Verfahren zum Entfernen von Pyritschwefel aus Kohle unter Verwendung von Ferriionen enthaltenden Loesungen). Text in German. (TRW Inc., Redondo Beach, Calif.) W. Ger. Pat. Appl. 2,207,491. 19p., Feb. 17, 1972. (6 claims).*

Pyritic sulfur removal from coal can be accomplished by treatment with a ferric chloride solution followed by additional solvent extraction, e.g., with p-cresol as the sulfur solvent. Reaction temperatures may be between 50 and 110 C. The coal may have grain sizes between 0.07 and 12 mm. Between 72 and 93% of the pyritic sulfur concentration can be removed from the most varying kinds of coal within two hours with a 0.5 $FeCl_3$ solution. The $FeCl_3$ can be recovered to between 85 and 90% and recycled. Typical coals which can be treated by the process are those from Missouri, Lower Freeport, Bevier, Indiana No. 5, and Pittsburgh.

**40566** **APTIC NO. 64760**

Mori, Kunio, and Masahiko Matsuyama

STUDIES ON CENTRAL CLEANING SYSTEM (PART I.). *(Shuchu haijin hoshiki ni kansuru kenkyu (dai ippo)). Text in Japanese. Nagoya Joshi Daigaku Kiyo (Bull. Nagoya Women s Coll), no. 18:193-197, April 1972. 5 refs.*

A method to collect dust using a blower on the roof of houses is described. It saves much of the time and labor involved with the use of a vacuum cleaner. The cyclone collector was tested on pieces of paper, styrol aerosol, and rice hulls. The collecting efficiency was not affected by the veolocity of the wind, and fluctuated widely according to the specific gravity and the form of the dust. Cyclone types X, Y, and S were tested.

**40567** **APTIC NO. 63388**

Nagakura, Kiichiro, Tadashi Sato, and Takashi Watanabe

THE EFFECT OF BACK PRESSURE ON EXHAUST GAS COMPOSITION IN SPARK IGNITION ENGINE. *Technol. Rep. Iwate Univ., Merioka, no. 6:1-12, 1972. 2 refs. (Presented at the Japan Society of Mechanical Engineers, Tohoku Branch, Common Meeting, Akita, June 1972.)*

The results of a study made to examine the influence of back pressure in the exhaust of the air-cooling, single cylinder, four cycle, spark ignition test engine on the exhaust composition are discussed. The influences of back pressure, revolution, torque, and air-fuel ratio on carbon monoxide, carbon dioxide, hydrocarbon, nitric oxide, and oxygen emissions were studied. The CO, $CO_2$, and $O_2$ emissions were not influenced by back pressure at any load and revolution. Emissions did not increase with increasing loads and revolutions. Nitric oxide emission was independent of back pressure at high load, and decreased with increase of back pressure at low load. The HC emissions decreased to the same degree in the cases of back pressures of 100, 200, and 300 mm mercury as in the case of back pressure of 0 mm Hg. The HC emission decreased with increased loads and revolutions. The CO and HC emissions decreased with air/fuel ratios below 15:1. Beyond the 15:1 ratio, CO emission remained parallel and HC emission increased slightly. Nitric oxide emission increased with air/fuel ratio below 15:1 and decreased with a ratio above 15:1. Spark timing, manifold air pressure, compression ratio, and engine speed affected the emissions as well. (Author conclusions modified)

**40568** **APTIC NO. 62934**

Nikleva, S.

THE AIR POLLUTION POTENTIAL OF SLASH BURNING IN SOUTHWESTERN B.C. *Forestry Chronicle, 48(4):187-189, Aug. 1972.*

The feasibility of restricting slash burning to those periods when atmospheric conditions are favorable for the natural dispersal of smoke was investigated from mid-Aug. to mid-Oct., 1970 in the Vancouver Forest District of British Columbia. An attempt was made to measure the capacity of the atmosphere for smoke dispersal and to relate it to the observed frequency of slash burning. About 95% of the total slash burning in this district was conducted during the 2-month period. There were 187 company slash burning days. About 50% of all slash burns occurred when the Ventilation Indices (VI) were less than 200, and 80% of the burns occurred when the VI was less than 500. Most slash burning took place under atmospheric conditions not conducive to the natural dispersal of smoke. Only a small number of the total days indices greater than 500. Regulating prescribed burning to minimize the ensuing smoke pollution would decrease the number of days suitable for burning to a fraction of the number presently used.

**40569** **APTIC NO. 62970**

Noll, Paul H.

REMOVAL OF AMMONIA FROM WASTE GASES. *(Entfernung von Ammoniak aus Abgasen). Text in German. Chem. Anlagen Verfahren, no. 10:94-95, 1972.*

Laboratory and pilot tests concerning the catalytic destruction of ammonia and possibly other malodorous gases are described. Waste gases with ammonia concentrations of up to 1000 ppm were incinerated and deodorized by the use of adequate catalysts at temperatures below 275 C, preferably between 200 and 230 C, without the formation of nitrogen oxides.

**40570** **APTIC NO. 64495**

Patterson, Wayne A.

TREATMENT OF ORGANIC WASTE PRODUCTS. *(Assignee not given.) U. S. Pat 3,668,120. 4p., June 6, 1972. 3 refs. (Appl. April 22, 1971, 9 claims).*

A process and apparatus for the conversion of human organic waste products into harmless inoffensive gases are described which avoids the requirement of chemical additives, cleaning, and temperature maintenance associated with prior art devices. The waste products are combined with a quantity of water to form a slurry comprised of water and fine particles of waste products. The slurry is introduced below the surface of a body of molten metal so that carbon dioxide, water vapor, and other gases which are then introduced into a heated secondary combustion vessel to further oxidize the gases and produce harmless, inoffensive gases which may be vented to the atmosphere.

**40571** **APTIC NO. 62951**

Pintado Fe, Francisco and Jose Antonio Corrales Zarauza

SULFUR REMOVAL FROM COAL. *(Verfahren zur Entschwefelung von Koks durch Vorbehandlung der Kohle oder verkokbarer Ausgangsstoffe). Text in German. (Partronato de Investigacion Cientifica y Tecnica Juan de la Cierva, del Consejo Superior de Investigaciones Cientificas, Madrid (Spain)) W. Ger. Pat. Appl. 2,202,620. 8p., Sept. 7, 1972. (Appl. Jan. 20, 1972, 6 claims).*

A method for the chemical pretreatment of raw coal or washed coal prior to coking for the removal of sulfur is described. Raw coal with a grain size of 0.5-12 mm, or washed coal ground to the same grain size is treated with wash water to which 40% nitric acid, 10% sodium hypochlorite, hydrogen peroxide, nitrates, permanganates or their mixtures were added for 5 min to 24 hrs, and preferably for 1 to 2 hrs. The wash liquid is recycled, and after oxidation, the pretreated coal is washed for the removal of the reagents and of the soluble residues prior to coking. The wash liquid temperature may range from 0 C to 50 C.

**40572** **APTIC NO. 63103**

Princiotta, Frank T. and Norman Kaplan

CONTROL OF SULFUR OXIDE POLLUTION FROM POWER PLANTS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Control Systems Div., 46p., Oct. 1972.*

Various control processes for the control of sulfur oxides from power plants are compared with each other in terms of removal efficiency, capital and operating costs, and with low-sulfur fuel. Among the processes considered to be sufficiently well characterized to potentially make a significant contribution to sulfur dioxide control within the next 5 years, viz., wet lime/limestone scrubbing process, wet magnesium oxide scrubbing, catalytic-oxidation, and sodium sulfite scrubbing with regeneration (Wellman-Lord process), catalytic-oxidation is the most expensive. Except for dry limestone processes, all processes have sufficiently high SO2 removal efficiencies. In general, capital costs are in the range of $27-$41/Kw for new 1000 Mw systems and from $46-$64/Kw for a 200 Mw normal retrofit case. Operating costs are in the range of 1.1-1.5 mills/Kw-hr for new 1000 Mw units and from 2.2-3.0 mills/Kw-hr for the 200 Mw retrofit case. About 22 full-size desulfurization control processes for power plants are in the design, construction, or operation phase in the United States at the present time; 16 of these are wet lime/limestone systems.

**40573** **APTIC NO. 64455**

Rogers, Joe E.

APPARATUS FOR PREVENTING ESCAPE OF FUEL VAPOR FROM INTERNAL COMBUSTION ENGINE. *(Assignee not given.) U. S. Pat. 3,683,878. 6p., Aug. 15, 1972. 9 refs. (Appl. Feb. 16, 1971, 10 claims).*

During warm weather there is considerable boil-off of fuel from automobile engine carburetors causing air pollution, engine flooding, and fuel waste. Fuel tank evaporation can also cause air pollution and can be a fire hazard. Therefore, an invention was developed to collect excess fuel vapors from the carburetor and tank and to return the collected fuel to the fuel tank. This invention eliminates starting problems resulting from fuel boil-off eliminates the problem of vapor lock associated with conventional liquid fuel pumps by eliminating all vapor in the fuel line and by utilizing an air pump to maintain a pressure head on the fuel tank, and improves fuel economy. It also uses the apparatus as the engine fuel pump to collect and return vapors to the fuel tank, eliminating the need for a conventional fuel pump. The fuel system provides an uninterrupted flow of fuel to the carburetor, eliminating the disadvantages previously associated with the pulsating flow of conventional liquid fuel pumps. The apparatus withdraws fumes from the fuel tank when the tank is being filled with fresh fuel to prevent the escape of these fumes into the atmosphere. The apparatus can be used for filling the fuel tank from a fuel storage area, such as a commercial service station, by utilizing the suction head created by the engine during operatio to provide a negative pressure in the tank, thus eliminating the need for a fuel pump at the storage area.

**40574** **APTIC NO. 62975**

Trempu, Rene and Jean-Pierre Gayda

REMOVAL OF SULFURIC ACID FROM A GAS FLOW. *(Verfahren zur Entfernung von Schwefelsaeure aus einem Gasstrom). Text in German. (Compagnie Industrielle des Telecommunications Cit-Alcatel, Paris (France)) W. Ger. Pat. Appl. 2,231,199. 8p., June 26, 1972. (3 claims).*

Sulfuric acid (4000 ppm) in a gas flow from the desulfurization of fuels was removed by treating the gas in a counterflow with a sprayed washing solution of 2-3 pH containing 8 g ferric sulfate/l and 120 g ferrous sulfate/l with additional injection of air.

**40575** **APTIC NO. 60619**

Ushimaru, Yutaka, Matsuo Koichi, and Tochio Yukihiro

CATALYST FOR THE CONVERSION OF GASES, AND PROCESS FOR ITS PRODUCTION. *(Katalysator zur Umsetzung von Gasen und Verfahren zu seiner Herstellung). Text in German. (Mitsui Mining and Smelting Co. Ltd., Tokyo, Japan) W. Ger. Pat. Appl. 2,237,458. 18p., Feb. 22, 1972. (9 claims).*

A catalyst for the conversion of carbon monoxide and hydrocarbons in automotive exhaust gases and other waste gases is described. The catalyst is composed of particles of catalytic oxides, such as manganese oxides, copper oxides, iron oxides, lead oxides, zinc oxides, bismuth oxides, clay, silica, and/or magnesia. The catalytic oxide particles are coated with copper, iron, and/or zinc powder, and plated with dehydrated chromate film. The manganese oxides make up more than 20% of the total weight of the catalytic oxides, while the total of the copper, iron and/or zinc powder amounts to 0.1-50% of the weight of the catalytic oxides. The particles of the copper, iron, and/or zinc powder are smaller than 150 micron.

**40576** **APTIC NO. 64482**

Yamada, Hiroya

PERFORMANCE CAPACITY OF CYCLONE DUST COLLECTORS. REPORT 1. AIR FLOW IN THE CYCLONE. *(Saikuron shunjinki no seiao ni tsuite. Dai-1 po. Saikuron shunjinkinai no kiryu ni tsuite). Text in Japanese. Daido Kogyo Daigaku Kiyo (Bull. Daido Tech. Coll.), vol. 8:65-73, 1972. 14 refs.*

To clarify the relationship between dust particle concentration and performance characteristics of a blower, the flow behavior in a cyclone, particularly in the cone, was investigated. The result confirmed the known flow distribution in the cylinder, but somewhat different phenomena were observed in the cone. The pressure distribution in the radius direction of the cone was similar to that of the cylinder in the center area, however, the peripheral pressure decreased in the downward direction. The pressure distribution in the lower part of the cylinder was symmetrical in regard to the cylindrical axis, but in the upper part the center of symmetry deviated from the cylindrical axis in the upward direction. The composite velocity and circumferential velocity decreased in the downward direction in the cylinder, and increased in the downward direction in the cone. The distance between the axis and transition point from downward flow to upward flow in the cylinder was somewhat different from that in the cone.

**40577** **APTIC NO. 62968**

(Inventor not given.)

EXHAUST RECIRCULATION SYSTEM FOR MOTOR VEHICLES. *(Nissan Motor Co., Yokohama (Japan)) Brit. Pat. 1,262,252. 9p., Feb. 2, 1972. (Appl. Jan. 13, 1970, 8 claims).*

An exhaust recirculation system for motor vehicles is described which can reduce nitrogen oxides in vehicle exhaust. The exhaust gases are recirculated to the intake manifold when the engine is driven under predetermined conditions represented by the level of the vacuum in the intake manifold and the angular position of the throttle valve of the carburetor. Previous recirculation devices worked continuously, which resulted in unstable engine operation, decreased engine output, and contamination in the engine. This invention eliminates the drawbacks resulting from continuous recirculation by recirculating the exhaust gases only when the engine is driven under predetermined conditions in which the motor vehicle accelerates or climbs up a hill.

## 1971

**40578** **APTIC NO. 63115**

Collins, D. C., W. S. Meisel, and M. D. Tenner

MULTI-OBJECTIVE EVALUATION OF A TRAFFIC RESTRICTION POLICY FOR AIR POLLUTION EPISODE CONTROL (INTERIM REPORT). *Technology Service Corp., Santa Monica, Calif., Data Science, Air Force Office of Scientific Research Contract F44620-71-C-0093, Proj. 9749, 61120F, 681304, AFOSR-TRO72-1218, TSC-030, 58p., Nov. 1971. 21 refs.*

NTIS, DDC: AD-744121

A traffic restriction policy for air pollution episode control was evaluated. It is based upon established models for the dynamics of the pollutant reactions, the effect of the control strategy upon traffic and speed distribution, and empirical results relating speed distributions to raw pollutant generation. These models are implemented on a digital computer. An exemplar control strategy is postulated and evaluated with respect to the objective functions measuring separatley, benefit and cost of control. The control strategy encourages multiple riders by penalizing one-person vehicles during certain peak traffic hours. The length of the penalty period is a function of the expected level of a pollutant, ozone. The objective functions are a measure of the pollutants over a 1-week period and a measure of the inconvenience and enforcement costs incurred.

**40579** **APTIC NO. 64594**

Elliott, Dale E. and Harry C. Fischer

OPEN-CYCLE AMMONIA REFRIGERATION. *ASHRAE (Am. Soc. Heating Refrig. Air Cond. Engrs. J.), 13(12):55-60, Dec. 1971.*

An open-cycle ammonia refrigeration system is described which vents the vaporized refrigerant from the system to the atmosphere through a catalytic dissociator-combustor. An auxiliary liquid petroleum gas system is used to start up the dissociator- combustor for preheating of the catalyst to 1000 F in order to initiate ammonia dissociation and consequent hydrogen production for sustained combustion. A capillary tube limits the flow of ammonia to that which can be handled by the dissociator-combustor in order to prevent overloading. The burning of ammonia in the combustor results in the discharge of nitrogen and water vapors to the atmosphere, with the exhaust gases being pollution-free since no carbon oxides are emitted and nitrogen oxides are kept below 100 ppm.

**40580** **APTIC NO. 64561**

Haensel, Vladimir

CONVERTED MUFFLER TO OXIDATE ENGINE EXHAUST GASES. *(Vorrichtung zur Oxydation der Abgase von Brennkraftmaschinen). Text in German. (Universal Oil Products Co., Des Plaines, Ill.) W. Ger. Pat. Appl. 2,014,920. 8p., Oct. 21, 1971, 3 claims).*

An oxidation chamber for the exhaust system of an internal combustion engine contains two catalysts. The catalyst near the inlet is suitable for the low temperature conversion of gas with low impurities. It contains 0.01-1 wt% of platinum-gp metal supported on alumina, preferably obtained by impregnating alumina spheres with Pt-cpd. and treating in the presence of sulfur-containing carboxylic acid. The catalyst near the outlet is also 0.01-1 wt% Pt-gp metal on alumina but also contains 1-20 wt% calcium, strontium, or barium, preferably as barium oxide.

**40581** **APTIC NO. 62967**

Hennenberger, Karl-Heinz

PROCESS FOR REMOVING OXIDIC SULPHUR COMPOUNDS FROM GASES CONTAINING SUCH COMPOUNDS. *(Norddeutsche Affinerie, Hamburg (West Germany)) Brit. Pat. 1,251,925. 2p., Nov. 3, 1971. (Appl. May 8, 1970, 7 claims).*

A process is described for removing oxidic sulfur compounds such as sulfur dioxide from flue gas by copper oxide absorption. Previous copper oxide absorption methods did not give a satisfactory degree of purification, and the regeneration of the absorbent was complicated and expensive. In this method, the waste gases are passed through an aqueous suspension of copper oxide or another oxygen-containing compound of divalent copper such that SO2 is virtually completely removed and copper sulfate is easily produced. The very pure copper sulfate formed can be recovered, or other pure copper compounds such as copper chloride or copper carbonate can be formed. A particularly pure exhaust gas can be obtained if the stack gas is passed through two successive stages of copper oxide.

**40582** **APTIC NO. 64536**

Mandriko, A. S. and I. L. Peisakhov

THE USE OF STEEL GAUZE FOR DUST CLEANING OF GASES IN THE IRON AND STEEL INDUSTRY. *Steel (USSR) (English translation from Russian of: Stal), 1(12):993, Dec. 1971.*

Many pyrometallurgical plants for the production of compounds of rare-earth and nonferrous metals use gauze filters. Since the process gases in iron and steel metallurgical works have a high temperature and contain various aggressive components, gauzes of natural wool fiber, nitron, ftorlon, glass, and other fibers pose many drawbacks. Metal gauze will withstand a far higher temperature (600-1000 C) than glass gauze or synthetic fiber, is easily regenerated by reverse blowing with low-pressure gas, ensures a high specific throughput with a simpler filter design, and can be effective in cleaning dust from various hot gases. The fine captured dust forms an additional filtering layer. No condensate should be allowed to form in these filters. Therefore, the use of metal gauze in filters for dust collection from gases in ferrous metallurgy is promising. (Author abstract modified)

**40583** **APTIC NO. 60557**

Templin, Robert James, Paul Russell Johnson, Robert Fred Falberg, and Edward Nicholas Cole

INTERNAL COMBUSTION ENGINE EXHAUST SYSTEM. *(Abgasanlage fuer Brennkraftmaschinen). Text in German. (General Motors Corp., Detroit, Mich.) W. Ger. Pat. Appl. 2,149,099. 27p., Sept. 28, 1971. (12 claims).*

A catalytic afterburner for cleaning internal combustion engine exhausts is described. Valves are controlled by the afterburner s minimum operating temperature. A storage container is connected via a changeover valve and a duct to the engine and a via two-way valve to the atmosphere and to the afterburner s outlet. A controller connects the valves only to the container at a temperature below the minimum value and shuts off the container from the engine. Above the minimum temperature, the afterburner is connected only to the atmosphere, and the container is connected to the engine.

**40584** **APTIC NO. 62960**

Whitelaw, Robert L.

THREE IMPERATIVES IN THE AUTOMOBILE FUTURE. *Proc. Int. Conf. Veh. Mech., 2nd, Paris, France, 1971, p. 37-57. (Sept. 6-9.)*

Three technically feasible methods of reducing automobile fuel consumption and pollutant emissions are presented which could show an estimated 50 billion gallons of fuel savings per year. The first method involves the use of a hydrostatic transmission which permits free choice of engine speed at any wheel speed, thus permitting the engine to operate at best efficiency at all speeds and saving up to 33% in fuel. The second approach is the production of an efficient, non-polluting local-duty vehicle made possible by combining the filament-wound flywheel for energy storage with the lead-acid battery for power surge. New ultrafine filaments can now provide flywheel energy storage near 200 wh/kg, far in excess of today s best battery. Such a vehicle would be non-polluting, noiseless, and efficient, with a savings of almost 20 billion gallons of fuel per year. The third method involves the design of an aerodynamically cleaner body for automobiles which could result in an additional annual fuel saving of 15 billion gallons.

**40585** **APTIC NO. 63067**

United Nations, Dept. of Economic and Social Affairs

THE DEVELOPMENT OF SMOKELESS FUELS FROM COAL FROM THE STANDPOINT OF MINIMIZING ENVIRONMENTAL POLLUTION *Preprint, 34p., June 1971. 45 refs. (Presented at the United Nations Conference on Human Environment, 1971.) (Available from Univ. Microfilms, Inc., Ann Arbor, Mich., Order no. WO 62039 2.25.)*

Because coal is the greatest available fossil fuel resource, much of the increasing need for energy must be supplied by coal in the near future. Applicable technology is described to greatly reduce the pollution effects of the products of coal combustion by reducing volatile and sulfur content of solid fuel and by convertin coal to fuel gas that is cleaned of sulfur compounds before combustion. Developing countries possessing ample coal resources may manufacture smokeless briquettes for remote areas with dispersed population and distribute clean low to medium Btu gas for urban areas and for industry. As economic growth increases, mine-mouth coal gasification to high-Btu gas is suggested, with the establishment of a national gas transmission grid. Several types of methods for removing sulfur dioxide from flue gases and for gasifying coal are described. (Author abstract modified)

**40586** **APTIC NO. 64598**

DUST EMISSION CONTROL IN THE CEMENT INDUSTRY OF WEST GERMANY. *(Comment l industrie du ciment de la Republique Federale Allemande controle les emissions de poussiere). Text in French. Cim. Chaux, no. 603:26-29, June 1971.*

The dust emission control techniques employed in cement works in West Germany and their results are presented. The construction of new, modern plants equipped with high-efficiency dust separators has resulted in an abatement of the specific dust emission from 1.5% in 1955 to 0.15% at the present time. While some 30% of all rotary kilns were equipped with electrostatic precipitators, this figure has currently increased to nearly 100%. In a 100-sq km area accommodating 15 cement works, the annual mean dust fall currently amounts to 0.42 g/sq m/day against 0.75 g/sq m/day in 1950. Electrostatic precipitators, tissue filters, and gravel filters are primarily used for dust separation in the cement industry. The hot gases leaving the rotary kilns at 320-380 C are cooled to 90-120 C for electrostatic dust separation.

### 1970

**40587** **APTIC NO. 64576**

Hochgesand, Gerhard

HYDROGEN FROM CRUDE CARBON MONOXIDE/HYDROGEN GAS. *(Verfahren zur Herstellung von Wasserstoff aus CO- und H2-reichen, CO2 und Schwefelverbindungen enthaltenden Rohgasen). Text in German. (Metallgesellschaft AG, Frankfurt (Germany)) W. Ger. Pat. Appl. 1,567,690. 9p., June 11, 1970. (7 claims).*

Hydrogen is produced from carbon monoxide and H2-rich crude gases containing carbon dioxide and sulfur compounds, obtained by cracking liquid or gaseous hydrocarbons under high pressure of less than 40 atm by (a) catalytic reaction of the CO with steam to CO2 and H2; (b) selective removal of acid gas components by scrubbing with an organic polar liquid in 2 stages, one (b1) before and one (b2) after stage (a); and (c) fine purification to remove residual CO and also methane, oxygen, and argon. Process comprises carry out stage (b1) at relatively high preferably ambient, temperature and (b2) at lower temperature, below the CO2 dew point of the converted gas, (b1) and (b2) being carried out with the same washing agent (I) and with joint regeneration. The (I) regenerated by expansion and boiling is passed directly through stage (b2) for removal of CO2 by condensation and absorption through direct heat and material exchange with the compressed gas, then largely freed from CO2 by expansion and, after heating, preferably by indirect heat exchange with regenerated (I), passed through stage (b1) for removal of S components. Removal of the CO2 in the presence of liquid (I) is simpler and better technically than condensation of CO2 by indirect cooling.

### 1969

**40588** **APTIC NO. 62959**

Tabak, Fernando

COMBUSTION CHAMBER FOR EXHAUST. *(Verbrennungsgeraet fuer Abgase). Text in German. (Universal Oil Products Co., Des Plaines, Ill.) W. Ger. Pat. Appl. 1,962,800. 4p., Dec. 15, 1969. 7 refs. (1 claim).*

A combustion chamber for burning exhaust gases is described. It is surrounded concentrically by a heat exchanger in which the exhaust gases are preheated. The radial burner has the shape of a truncated cone, the wider opening being at the outlet side. An annular guide at the burner outlet applies a spiral motion to part of the exhaust gas.

### 1968

**40589** **APTIC NO. 62976**

Cremer, Walter

DUST REMOVER FOR COKE OVEN COKE DISCHARGE. *(Einrichtung zum Entfernen des beim Ausstossen von Koks aus Verkokungskammeroefen entstehenden Staubes). Text in German. (Heinrich Koppers GmbH, Essen (West Germany)) W. Ger. Pat. Appl. 1,812,897. 5p., Dec. 5, 1968. (5 claims).*

A dust remover for coke oven discharge is described consisting of a hood with suction and dust removal units. The hood can travel, independently of the coke transport car, along the battery on the tracks on both sides of the quencher car track. The hood is a portal construction, beneath which the quencher car can pass.

**40590** **APTIC NO. 62992**

Masaki, Kenji and Hiroyuki Maruoka

CARBURETOR FOR COMBUSTION ENGINES. *(Vergaser fuer Brennkraftmaschinen). Text in German. (Nissan Motor Co., Ltd., Yokohama (Japan)) W. Ger. Pat. Appl. 1,816,211. 6p., Dec. 20, 1968. 6 refs. (5 claims).*

A carburetor is describe[illegible] the means to admit additional air into the slow running emulsifying jet only when the engine is retarded, so that the engine's braking effect is not influenced and the toxic exhaust emission is minimized. A diaphragm valve open to the atmosphere on one side and terminating in a jet opening downstream to the throttle valve on the other, seals an aperture to the slow running jet in the open throttle condition. On closed throttle, manifold depression acts on the diaphragm so that additional air and fuel is admitted. An alternative design employs an electromagnetic valve to regulate the additional air-mixture.

### 1967

**40591** **APTIC NO. 63100**

Teller, Aaron J. and Srini Vasan

CROSSFLOW SCRUBBING PROCESS. *(Assignee not given.) U. S. Pat. 3,324,630. 7p., June 13, 1967. 8 refs. (Appl. June 7, 1965, 3 claims).*

A crossflow scrubbing process for the removal of particulate material from gases is described which, unlike prior art devices, has a relatively high rate of gas flow through the packing material and thereby achieves essentially streamline flow conditions for effective particle removal. The gas stream is first passed through a cyclone separator, a spray tower, or a venturi for removal of larger particles and is then passed through a packing having little continuous extensive surface and using a scrubbing liquid in crossflow with the gas stream. The filamentous packing presents narrow rectangular elements to the gas flow and thereby optimizes capture of the particles.

**40592** **APTIC NO. 64532**

Wegman, Leonard S.

THE CLEANEST INCINERATOR STACK GASES. *Am. City, 82(5):89-90, 142, 144, May 1967.*

A new incinerator serving the Long Island, N. Y., north-shore area of North Hempstead had to be exceedingly clean because its immediate neighbors were upper-middle-income communities with exacting residential standards and a strong dislike of any incinerator at all. The site was selected because of many logistic advantages, and the plant was designed with extra air pollution control equipment. After leaving settling and expansion chambers, the stack gases pass through a spray chamber, an air-cooling chamber, cyclones, an induced draft fan, and a large flue before reaching the stack. The stack extends 265 ft into the air to help the effluent gases pierce the prevailing meteorological ceiling for dispersion and atmospheric dilution. Special control loops were used to coordinate the control system. A fail-safe damper system and a bypass flue were installed, as well as an emergency power system. Air-cooled walls were used in the furnace construction to reduce slagging to a minimum and to extend furnace life. Two water systems were used for quenching, sluicing, and fly ash removal: a fresh water system and a recirculated water system.

### 1964

**40593** **APTIC NO. 64523**

Walker, A. B.

ELECTROSTATIC PRECIPITATORS. *Am. City, 79(9):148, 150, 152, Sept. 1964.*

Most control equipment now in use usually falls short of the present requirement of about 60% efficiency for particulate removal to meet emission standards for municipal incinerators. Electrostatic precipitators, on the other hand, easily attain efficiencies of 60%, and 90-95% efficiencies are obtained at reasonable cost. At 90% efficiency, the dust discharged would be in the range of 0.2 lbs/1000 lbs of gas; at 95% efficiency it would be in the range of 0.1 lbs/1000 lbs of gas. These are far below the standard of 0.85 lbs/1000 lbs of gas. Electrostatic precipitators can be used for incinerators in apartment houses and for municipal and industrial plants for 50 tons/day capacity and up. Precipitators can be used for fly ash collection if special provision is made for removal of collected material from the electrodes. This removal can be accomplished by vibration and flushing of the electrodes. Various characteristics of the precipitators and results of tests on an incinerator are reviewed.

### 1956

**40594** **APTIC NO. 64539**

Ruff, R. J.

CATALYTIC COMBUSTION FOR METAL LITHOGRAPHING OVENS. *Org. Finish., vol. 17:12-15, April 1956. 3 refs. (Presented at the National Metal Decorators Association Convention, Atlantic City, N. J., Oct. 10, 1955.)*

Strict air pollution control regulations and the fact that vaporized solvents released from the baking process in sheet-type metal decoration can be recovered for heat energy have led to increased concern regarding control of fume emissions. Catalytic combustion can be used to remove the fumes from metal lithographing ovens. The mechanisms of this process are discussed, and the performance of this process in handling fumes from metal decorating ovens is described. The heat from the exhaust gases can be recovered, which makes this process economical.

## MEASUREMENT METHODS

### 1974

**40595** **APTIC NO. 62914**

Akselsson, R. and T. B. Johansson

A BEAM MAPPING METHOD. *In: Mutli-Element Trace Analysis by Proton Induced X-ray Emission. Thomas B. Johansson (ed.), Lund, Sweden, May 20, 1974, Chapt. II, p. 5-6. 3 refs. (Also: Nucl. Instrum. Methods, vol. 91:663-664, 1971.)*

A method to examine the particle distribution in a beam by moving a small probe in it and measuring the characteristic X-rays derived from the probe is described. Particle-excited characteristic X-ray can be used in trace analysis. In the experiment, the proton beam was swept electrostatically by triangular waves applied to parallel plates in the beam tube. The maximum amplitudes were sufficiently large to sweep the focused beam out of the collimator hole. The frequencies were 33 Hz and 262 Hz in the perpendicular y direction. The aluminum absorber allowed the detector to be moved near the target, since it reduced the amount of low energy X-rays to the detector. A typical profile through the proton beam is given.

**40596** **APTIC NO. 62916**

Akselsson, R. and T. B. Johansson

X-RAY PRODUCTION BY 1.5-11 MEV PROTONS. *In: Multi-Element Trace Analysis by Proton Induced X-ray Emission. Thomas B. Johansson (ed.), Lund, Sweden, May 20, 1974, Chapt. IV, p. 23-33. 30 refs. (Also: Z. Phys., no. 266:245-255, 1974.)*

K-shell ionization and L X-ray production cross-sections by proton impact were determined from measurements of K X-ray yields from thin tragets of titanium, iron, cobalt, copper, nickel, and silver and of L X-ray yields from gold and lead. The proton energies varied from 1.5 to 11 MeV. A silicon(lithium) semiconductor detector recorded the X-rays. The total error in the measured cross-sections was mostly less than 5%. K beta/K alpha ratios and L lambda, beta, gamma/L alpha ratios were determined. Ionization cross-sections were compared with predictions of the plane-wave Born approximation (PWBA) and the binary-encounter approximation (BEA). Both theories described the ionization quite well: PWBA was, however, better for higher proton energies, whereas BEA was superior for lower energies. An empirical formula for ionization cross-sections is derived. (Author abstract)

**40597** **APTIC NO. 64828**

Alex, Wulf, Bernd Koglin, and Kurt Leschonski

PARTICLE SIZE ANALYSIS. *(Teilchengroessenanalyse). Text in German. Chem.-Ing.-Tech., 46(11):477-480, June 1974. 8 refs.*

Various particle counting methods and instruments are reviewed. Mechanical sieving and gravimetry are simplest counting techniques. The Coultier counter exploits the change in electric resistance caused by particles suspended in an electrolyte passing through a counting orifice. Langer s acoustic counter uses a microphone for the pickup and amplification of the acoustic signal generated by individual particles passing through a tapered tube section. A laser counter by Schleusener utilizes the changes caused in the electromagnetic field by particles flying through a resonance space. Flow photometers with electric eye in the path of the particles suspended in a liquid, and light-scattering counters have been developed. Counting errors due to the presence of more than one particle in the counter space can be avoided by reduction of the particle concentration by dilution.

**40598** **APTIC NO. 63348**

Bernert, Juergen

EXPERIENCES WITH THE DETERMINATION OF MINERAL OIL MISTS IN FLOWING GASES. *(Erfahrungen bei der Bestimmung von Mineraloel-Nebeln in stroemenden Gasen). Text in German. Wasser Luft Betrieb, 18(5/6):302-304, 1974. 9 refs.*

For cooling the tools for mechanical metal treatment oils and emulsions are used which partly evaporate. The developing oil mists are usually drawn off and in most cases are emitted directly into the atmosphere. The difficulties concerning measurement of oil mists in flowing gases, which are needed for the development, construction and monitoring of oil separators, are outlined. The most problematic part of such measurements is sampling due to the different chemical and physical properties of the oil used and the different processes of development of the oil mists, e.g., by decompression or heat or by being thrown out by rotating machines. Since the method of weighing the difference between oil-loaded and unloaded filters was found too inaccurate, the silica method was applied. The gas sample was passed through two consecutive quartz tubes filled with silica gel. The silica gel was transferred in the laboratory to an Erlenmayer flask and extracted with 20 ml ethyl tetrachloride for 24 hours. Despite optimum sampling speed it was found that part of the oil remained in the glass probe and never reached the silica gel. The sampling method was therefore modified by a filter head probe whose third filter head of stainless steel was packed with quartz wool and which preceded the quartz tubes filled with silica gel. As in the first case the oil concentration was determined by infrared spectrometry after separate extraction of the quartz wool and the silica gel with ethyl tetrachloride. This method also proved to be inaccurate because it was found that a considerable amount of oil was not in the flowing medium but flows along pipe walls. An accurate method for determination of the efficiency of oil separators is thus not available yet.

**40599** **APTIC NO. 63206**

Bertolotti, Mario, Mario Carnevale, Ludovico Muzii, and Daniele Sette

ATMOSPHERIC TURBULENCE EFFECTS ON THE PHASE OF LASER BEAMS. *Appl. Opt., 13(7):1582-1585, July 1974. 12 refs.*

Measurements of the phase structure function of a laser beam propagated through the turbulent atmosphere along two different paths are reported. The first path was chosen in an urban zone, the second one was along a flat and quiet region. A comparison of the results with the theoretical predictions of Tatarsky and Lutomirsky and Yura is made. A discussion of the range of validity of the theoretical treatments is presented. (Author abstract)

**40600** **APTIC NO. 63242**

Bespalenkova, Y. K., E. L. Grinzayd, and L. S. Nadezhina

OPTIMUM CONDITIONS OF PHOTOMETRIC DETERMINATION OF SULFUR DIOXIDE WITH FUCHSIN-FORMALDEHYDE REAGENT. *(Optimalnyye usloviya fotometricheskogo opredeleniya dvuokisi sery fuksin-formal degidnym reagentom). Text in Russian. Zh. Analit. Khim. (Moscow), 29(2):389-391, 1974. 7 refs.*

The optimum conditions of the photocolorimetric determination of sulfur dioxide by the fuchsin-formaldehyde reagent were determined by the mathematical planning method and regression analysis. The optimum concentrations of fuchsin, formaldehyde, and sulfuric acid for the colorimetric reaction were 0.0025%; 0.25%, and 0.1 g equivalent/liter, respectively. The molar extinction coefficient was 60,000.

**40601** **APTIC NO. 63119**

Bethea, R. M. and P. N. Lin

SCREENING TECHNIQUE FOR HAZARDOUS METALLIC COMPOUNDS IN PARTICULATE STACK EFFLUENTS. *Preprint, American Inst. of Chemical Engineers, New York, 29p., 1974. 16 refs. (Presented at the American Institute of Chemical Engineers, National Meeting, 76th, Tulsa, Okla., March 11, 1974, Paper 24c.)*

A rapid screening procedure suitable for field use in the nonferrous metallurgical industry was developed for the analysis of six hazardous metals in oxide form: beryllium, cadmium, copper, lead, mercury, and zinc. The qualitative procedures, originally based on standard geochemical and quantitative analysis methods, modified as necessary to conform to the anticipated lower detection limit required for screening particulate stack samples obtained as a result of emission or compliance. The detection limit is 1.0 + or - 0.1 mg of each cation per gram of particulate sample. Solubilization is achieved by digestion in 0.5 N nitric acid followed by selective solubilization of copper oxide and beryllium oxide in hot, 3 N HNO3 and hot, concentrated sulfuric acid, respectively. Subsequent cation separation and identification was obtained by dithiozone extraction in suitable solvents at appropriate pH. Interference free spot tests are used for the identification of the six cations present. The time required for solubilization is less than 1 hr; the extraction and qualitative tests require an additional 3 hr. (Author abstract modified)

**40602** **APTIC NO. 64813**

Block, C. and R. Dams

DETERMINATION OF SILICON AND OXYGEN IN COAL AND COAL ASH BY 14-MEV NEUTRON ACTIVATION. *Anal. Chim. Acta, 71(1):53-65, July 1974. 13 refs.*

It is possible that during combustion of coal containing silicon, aerosols containing high silicon concentrations can be formed. Therefore, oxygen and silicon were simultaneously determined in 40 coal samples and 20 coal ash samples by a 15 sec 14-MeV neutron activation analysis, followed by 15 sec and 2 min measurements of the induced nitrogen (16) and aluminum (28) activities after decay period of 5 and 75 sec, respectively. The standards consisted of silica mixed with spectrally pure graphite. Possible interferences were checked. Only aluminum and phosphorus interfered although slightly, and corrections were possible. The instrumental error (1.8-2.2%) and the inhomogeneity of the coal samples (1.5-2.5%) contributed to the overall reproducibility (2.5-3.5%). Silicon could be a measure of the ash content of coal. (Author summary modified)

**40603** **APTIC NO. 63379**

Braun, Robert D. and Joseph P. Sapio

ATOMIC ABSORPTION SPECTROSCOPY. *Chemistry, 47(6):9-13, June 1974. 14 refs.*

Atomic absorption analysis is discussed as an analytical tool for the determination of trace amounts of numerous chemical elements, geology, and pollution analysis. Four major advantages it has over other common methods of analysis are selectivity, sensitivity, speed, and expense. Atomic absorption is based on the absorption of light by the substance being analyzed. The absorbed light causes an electronic transition in atoms from a low to a high energy level. During this transition, a certain quanta of light is used (absorbed), thereby decreasing the light intensity after passage through the sample. Matrix matching and standard additions are two procedures used. Two major types of light sources are used: hollow-cathode lamps, and multielement lamps which contain cathodes made of, or containing, more than one element. Atomic absorption is subject to interferences from spectral, chemical, and ionization categories.

**40604** **APTIC NO. 63155**

Brocco, D. and M. Possanzini

A DEVICE FOR PREPARING STANDARD MIXTURES OF CARBON MONOXIDE. *Anal. Letters, 7(2):153-158, 1974. 6 refs.*

A simple and accurate system for preparing a steady carbon monoxide flow at constant, known composition, which can be used to calibrate automated analyzers of atmospheric CO, is described. Accurate, low concentrations of CO, at levels comparable with those found in ambient air, are prepared by permeation through a thin silicone membrane at a constant temperature. The lowering in CO pressure into a diffusing phial is a measure of permeation rate. The accuracy is within 3%. (Author abstract modified)

**40605** **APTIC NO. 63221**

Brockhaus, A.

SAMPLING OF TETRACYCLIC AROMATIC HYDROCARBONS UNDER ATMOSPHERIC CONDITIONS. *Atmos. Environ., 8(5):521, May 1974. 1 ref.*

A method of sampling lower hydrocarbons (with four or less ring systems) is described which uses glass fiber filters with glycerintricaprylate to get a sampling efficiency of nearly 100% for tetracyclic hydrocarbons. The excess of ester which would intefere with the determination of hydrocarbon aerosols is hydrolized prior to chromatography and eliminated. It is possible to trap 95-97% of pyrene and fluoranthene by ester-treated filters, compared with only 32-72% for untreated glass fiber filters.

**40606** **APTIC NO. 63070**

Campbell, Evan E., Gerry O. Wood, and Robert G. Anderson

DEVELOPMENT OF AIR SAMPLING TECHNIQUES. *California Univ., Los Alamos, N. Mex., Los Alamos Scientific Lab., Atomic Energy Commission Contract W-7405-ENG. 36, LASL Proj. R-059, Progress Rept. LA-5484-PR, UC-41, 6p., Jan. 1974.*

NTIS: LA-5484-PR

Essentially complete desorption of aromatic amines from silica gel by ethanol elution (30 sec minimum time) is confirmed in studies designed to develop air sampling techniques. An internal standard of n-heptanol improves the precision of the aromatic amine analysis by gas chromatography. Two silica gel tubes are proposed for both short-term and long-term sampling. The effects of several environmental factors on the storage of aromatic amine samples are examined, with migration of the sample to the backup section and oxidation of the sample being two problems of long-term storage. Recommended sampling tubes, rates, and times are tabulated for several aromatic amines. Studies relating to formaldehyde sampling with alumina indicate that water vapor is a serious interference; a search for a water-selective dryer or a formaldehyde-selective adsorbent is thus far unsuccessful. (Author abstract modified)

**40607** **APTIC NO. 63349**

Chapman, Robert L.

CONTINUOUS STACK MONITORING. *Environ. Sci. Technol., 8(6):520-525, June 1974. 5 refs.*

Continuous stack monitoring and basic approaches to the Environmental Protection Agency s stationary source requirements are discussed. Three basic approaches to source monitoring are extracting a continuous sample from the stack or duct and feeding it to any appropriate analytical instrument after initial conditioning by means of a sample handling/interface system; observing and analyzing the stack gas in situ by means of an optical instrument whose light path traverses the gases inside the stack or duct; and observing and analyzing the stack gases shortly after they leave the stack by means of remote optical instrument. Commercial instrumentation is readily available for the first two approaches. In the extractive approach, a continuous sample is drawn from the stack or process stream and transported to the analyzer which can be mounted in any convenient location. With the in situ approach, the instrument is mounted inside or just outside the stack. This approach provides an average reading across the whole stack and is an advantage over the point sampling approach that is most common with the extractive system. Performance standardization is recommended including standard methods for testing the performance of the analytical instruments and expressing the results.

**40608** **APTIC NO. 63276**

Cornell, Douglas and Wing Tsang

PYROLYSIS GENERATION OF DILUTE CONCENTRATION OF SULFUR DIOXIDE. *Anal. Chem., 46(7):933-935, June 1974. 6 refs.*

The generation of dilute concentration of sulfur dioxide in nitrogen or helium by the pyrolysis of trimethylene sulfone is described. The trimethylene sulfone decomposes solely by unimolecular reaction into equimolar amounts of pollutant molecule and nonpollutant molecule. At a flow rate of 20 cu m through the pyrolyzer, the sample is 3% decomposed at 400 C and 99% decomposed at 490 C. The SO2 concentration produced depends only on the vapor pressure of trimethylene sulfone. All that is required for calibration is a measurement of the vapor pressure of trimethylene sulfone as a function of temperature and a knowledge of the total gas pressure in the sample cell. The method offers convenience and economy of operation. The concentration of SO2 in the effluent stream may be conveniently set by adjusting the pyrolysis temperature or the temperature of the sample cell. The time interval required for the sample to reach its equilibrium vapor pressure when changing sample temperatures is negligible. Similar methods for nitric oxide, nitrogen dioxide, and carbon monoxide sources are under development.

**40609** **APTIC NO. 64838**

Garbuny, Max

GAS MONITORING SYSTEM. *(Westinghouse Electric Corp., Pittsburgh, Pa.) U. S. Pat. 3,788,742. 14p., Jan. 29, 1974. 4 refs. (Appl. June 24, 1971, 10 claims).*

This invention relates to a method for determining the presence, density, range, and depth of a particular molecular species in a gas distribution, and a method for obtaining measured values from which these quantities can be determined. A monochromatic laser beam tuned to a wavelength which coincides with one of the natural absorption lines of the gas molecular species to be detected is directed towards the gas medium being monitored. A remotely located receiver positioned in proximity to or near the laser system views the radiated region of the monitored gas in two spectral regions; one in the absorption band and the other on either side of the absorption band. The receiver developes signals from the backscattered irradiation in the time and frequency domain to determine thye presence and measure the density, depth, and range of the molecular species being detected in the illuminated cross-section of the monitored gas. A second method utilizes the polarization characteristics of the backscattered radiation, incurred from processes such as resonant imprisonment in the monitored gas, to determine the presence of the molecular species being detected. The invention improves on the prior art by solving the problem of matching the laser to all pollutants.

**40610** **APTIC NO. 63309**

Gibson, N. C. C., A. A. Casselman, and R. A. B. Bannard

AN IMPROVED GAS-LIQUID CHROMATOGRAPHIC METHOD FOR THE ANALYSIS OF BIS(2-CHLOROETHYL)SULFIDE COLLECTED FROM AIR BY SOLVENT ENTRAPMENT. *J. Chromatog., 92(1):162-165, May 8, 1974. 2 refs.*

A gas chromatograph equipped with a flame photometric detector and a filter specific for sulfur was used to measure mustard gas collected from air by solvent entrapment. Numerous high- boiling compounds such as chlorinated hydrocarbons, succinates, malonates, glycerol esters, benzoates, aliphatic and alicyclic HC, alcohols, and diols were examined as solvents for their gas chromatographic behavior. Selection was made on the basis of sharpness of separation of mustard from the solvent, together with short retention times to facilitate replicate analysis. Studies on the loss of solvent and mustard during aspiration of the solutions of mustard in these solvents with dry air restricted the possibilities to diethyl succinate and tributyrin. Diethyl succinate was finally selected as the more suitable. Solvent and mustard losses were much lower than with previous methods using an electron capture detector. Studies on the retention of solvent and mustard during aspiration of solutions containing 20-200 micrograms of mustard/ml of diethyl succinate indicated that solvent and mustard losses of 2.5 and 3.3%, respectively, could be expected. Average solvent and mustard losses of 2.4 and 2.7%, respectively, occurred for the collection of 584-684 micrograms of mustard, when the efficiency of collection of mustard vapor from dry air by diethyl succinate was examined.

**40611** **APTIC NO. 64739**

Goodson, Louis H., William B. Jacobs, and Andrew W. Davis

AIR POLLUTION MONITORING METHOD. *(Dept. of the Army, Washington, D. C.) U. S. Pat. 3,783,109. 3p., Jan. 1, 1974. 3 refs. (Appl March 24, 1972, 3 claims).*

A method is provided for continuous monitoring of airstreams for the presence of various types of pollutants, such as reducing substances, enzyme inhibiting substances, and oxidizing substances. The system has sufficient sensitivity and speed of response to enable airborne and/or aerosolized substances present in trace amounts to be detected and/or quantitated in a matter of a few seconds. The method proceeds by effective absorption of the pollutants in an absorbing solution by creating turbulent flow of the airstream and the absorbing solution prior to passing the absorbing solution containing the pollutants to an electrochemical cell whereby any electrical change produced in the electrodes of the electrochemical cell denotes the presence of pollutants. (Author abstract)

**40612** **APTIC NO. 63177**

Goto, Akihiro, Kazutaka Makino, Shigeki Toyama, and Koichi Iinoya

DEVELOPMENT OF PARTICLE SIZE ANALYZER FOR MIST AND ITS PROPERTIES. *(Misuto ryudo bunsekiki no kaihatsu to sono seino). Text in Japanese. Funtai Kogaku Kenkyu Kaishi (J. Res. Assoc. Powder Technol., Japan), 11(3):47-49, May 1974. 5 refs.*

An instrumental technique is described for measuring the concentration and size distribution of mist entrained in a chemical apparatus. The sampling gas which contains mist is fed into the cell, and the purge gas is spouted from the core in the direction opposite the sampling inlet. Varying the cut size in the range between 10 and several hundred micron by changing the velocity of the purge gas from 0-15 m/sec indicates that the instrument is a promising particle analyzer not only for mist but also for other kinds of particulate material.

**40613** **APTIC NO. 62941**

Griggs, Michael

A METHOD TO MEASURE THE ATMOSPHERIC AEROSOL CONTENT USING ERTS-1 DATA. *Preprint, Science Applications, Inc., La Jolla, Calif., 12p., 1974 (?). 18 refs.*

The feasibility of monitoring the atmospheric aerosol content on a global basis was determined using the ERTS-1 satellite. Theoretical studies show a linear relationship between the upwelling earth-atmosphere radiance and the aerosol content. This relationship was investigated at two test sites, San Diego and the Salton Sea, using the MSS radiance data, with ground truth observations of the aerosol content being made with a Volz photometer at the time of the satellite overpasses. Significant results relating the radiance over water surfaces to the atmospheric aerosol content have been obtained and indicate that the MSS channels, 4,5, and 6 centered at 0.55, 0.65, and 0.75 micron have comparable sensitivity, and that the aerosol content can be determined within + or - 10% with the assumed measurement errors of the MSS. (Author abstract modified)

**40614** **APTIC NO. 64626**

Hanaoka, Yuzuru

MANAGEMENT OF NDIR NOX METER FOR MAINTAINING ACCURACY OF MEASUREMENT. *(NDIR shiki NOx kei no seido iji no tame no kanri to mentenansu ni tsuite). Text in Japanese. Keiyro Kanri Keisoku Keiso (J. Instrum. Control Assoc., Japan), 23(5):6-8, 1974.*

To insure accurate measurement of nitrogen oxide by a nondispersive infrared nitrogen oxides meter, one must know the characteristics, capacity, principles, and structure of the apparatus and examine the environmental conditions in which the meter is utilized. The environmental temperature, humidity, vibration, and the electric sources and currents must be within the prescribed capacity of the apparatus. The electricity consumption of the apparatus, the electric line locations and system, the piping system, and the possibility of water condensation must be checked. The NDIR NOx meter is relatively free of influences of gas flow rate fluctuation, but the apparatus must be used correctly. The cycles for inspections, adjustments, and parts changes depend on the composition of sample gases, temeprature, and the amount of dusts. Periodical inspections should be made of the flow quantity of sample gases, zero check, span check, filter cleanliness, and the temperature of nitrogen dioxide-nitric oxide converter. Inspections of sample gas flow rate can indicate disorders such as clogging of the sample probe, deterioration of the pump, clogging of filters, disorder of the NO2-NO converter, and irregularities in the humidity eliminator. For this type of meter, parts changes required are the filter, the packing material for the NO2-NO converter. The former should be changed once a month, and the latter once in 3 to 6 months to maintain accurate zerodrift and response speed.

**40615** **APTIC NO. 64917**

Hashimoto, Shigeru, Mikihiro Kaneko, Yoshio Saiki, Shinichi Nishiyama, Yasuji Himi, Shozo Fukui, Saburo Kanno, Toshiko Koshimizu, Kazuyuki Takamatsu, and Yutaro Sekiguchi

STUDIES ON THE PRACTICAL APPLICATION OF AN ION ELECTRODE METHOD. (III) SURVEYS ON DETERMINATION METHOD OF CYANIDE IN AUTOMOBILE EXHAUST GAS. *(Ion denkyokuho no jitsuyoka ni kansuru kenkyu--jidosha haishutsu gasuchu no shian no bunsekiho no kento). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep., Kanagawa Prefect. Environ. Cent.), no. 5:82-85, Feb. 1974. 1 ref.*

An ion electrode method for the determination of cyanide in gas containing large amounts of carbon dioxide, such as automobile exhaust, is described. The method overcomes CO2 interference problems associated with the conventional pyridine-pyrazolone method of CN determination. The exhaust gas is absorbed in 5 N sodium hydroxide solution, followed by pH adjustment to 12.7-13.0, addition of lead-NaOH solution, and potential determination. The CN anion concentration is then calculated. Comparison data are given for measured CN values obtained by both methods.

**40616** **APTIC NO. 64496**

Heydek, J., J. Gebhart, W. Stahlhofen, and J. Porstendorfer

COMPARISON OF OPTICAL AND CENTRIFUGAL PARTICLE SIZE ANALYSIS. *Inst. Natl. Rech. Chim. Appl., Paris (France), Inst. Natl. Rech. Chim. Appl., 11eme, Colloq. Int. Atmos. Polluees, Proc., Paris (France), 1974, 9p. 12 refs. (May 8-10.)*

An optical and a centrifugal particle size spectrometer are used to measure the geometric diameter of airborne droplets as well as the Stokes and light scattering diameters of nonspherical aerosol particles. A helium-neon laser aerosol size spectrometer (LASS) and a spiral centrifuge were utilized to measure the distribution of geometric diameters of airborne di-2-ethylehexyl sebacate (DES) droplets in the submicron size range. The droplets were produced by condensation of DES vapor upon sodium chloride nuclei in a stream of pure nitrogen. Cluster aggregates of uniform polystyrene spheres generated by nebulization of polystyrene lattices served as nonspherical particles. Both instruments were calibrated with transparent polystyrene spheres. Their diameter distributions were redetermined by means of electron microscopy with an accuracy of 2%. In order to reduce instrumental errors and to provide an internal size reference, the DES aerosols were mixed with polystyrene aerosols of suitable and known diameter distributions.

**40617** **APTIC NO. 63163**

Hluchan, E., M. Jenik, and E. Maly

DETERMINATION OF AIR-BORNE POLYCYCLIC HYDROCARBONS BY PAPER CHROMATOGRAPHY. *J. Chromatog., vol. 91:531-538, April 1974. 7 refs.*

The determination of air-borne polycyclic hydrocarbons from various sources by paper chromatography is described. A paper chromatographic solvent system and an extraction and concentration microtechniques were used to determine airborne 1,2:3,4-dibenzopyrene, 3,4-benzofluoranthene, 3,4-benzopyrene, 1,12-benzoperylene, and anthanthrene in an automobile tunnel, in frequented cross roads, and in sites with little or no automobile traffic. Fluoranthene, pyrene, chrysene, 1,2-benzanthracene, 1,2:5,6-dibenzanthracene, 11,12-benzofluoranthene, and coronene were identified on the same chromatogram, 1,2-benzopyrene was presumed. Using at least three filters in series, quantitative air sampling of penta- and higher cyclic hydrocarbons is claimed. The results are tabulated. (Author summary modified)

**40618** **APTIC NO. 64852**

Hoevermann, Werner and Ulrich Jechi

A METHOD OF AIR-POLLUTION CONTROL BY GAS CHROMATOGRAPHY. *Siemens Rev., 41(5):207-211, 1974. 12 refs.*

The use of automatic gas chromatography in the analysis of air pollutants is discussed. The vast number of impurities necessitates substance-oriented analysis which furnishes information of an adequately precise quantitative nature despite the extremely low trace concentrations which often prevail. A L150 lab gas chromatograph with condensing and injecting equipment and a program transmitter was used to test air in an industrial plant. Among the compounds identified were benzene, acetone, ethanol, and crotonaldehyde. The concentrations were very high towards the weekend but tended to drop rapidly to lower values after working hours. At the beginning of the week they jumped up again. A similar cycle was observed each day. Both the apparatus and chromatography were capable of analyzing the quality of impurities automatically and with adequate accuracy.

**40619** **APTIC NO. 64485**

Homma, K.

THE RECENT STATE OF MEASUREMENT METHODS FOR ROOM AIR POLLUTION. *(Shitsunai kuki osen no sokuteiho ni okeru saikin no jokyo ni tsuite). Text in Japanese. Kuki Seijo (Clean Air-J. Japan Air Cleaning Assoc., Tokyo), 11(2):13-26, March 1974.*

Three methods for the measurements of airborne particulates are described. In the direct-weight concentration method, particles larger than 10 micron are separated by a multi-plate filter, a cyclone separator or collision separator, and the particles under 10 micron are then collected and measured. A filter with 33 7 time 4.5 sq cm plates was needed to separate particles larger than 10 micron completely from small particles in air at a flow rate of 20 l/min. Experimental results obtained from lead particles separated by a glass fiber filter was consistent with theoretical calculation. A cyclone separator consisting of three cyclones in an outer circle and a filter paper collector in the center is designed according to a theoretical equation. A gas inlet of 8.0 mm in diameter was required to give complete separation while a diameter of 6.5 mm was given by theoretical calculation. A middle volume sampler of the collision type with a capacity of 100 l/min was designed to replace a low volume sampler of the same type which gave relatively unsatisfactory accuracy. Calculations by Ranz-Wong equation show that 400 nozzles having a diameter of 1.81 mm each are required for 95% separation at this flow rate.

**40620** **APTIC NO. 63369**

Hori, Masahiro, Eiji Kato, and Yoshitaka Kobayashi

CONTINUOUS MICROANALYSIS OF HALOGENS USING MERCURY ATOMIC ABSORPTION SPECTROPHOTOMETRY-ANALYTICAL STUDY OF TRACE POLLUTANTS. *(Suigin genshi kyukoho o mochiiru sankasei gasu no renzoku biryo bunseki--biryo taiki osenshitsu no bunseki kagakuteki kenkyu). Text in Japanese. Preprint, Japan Inst. for Architecture, Tokyo, p 13, 1974. (Presented at the Japan Institute of Architecture Symposium on Safety Engineering, 5th, Tokyo, Japan, June 20-21, 1974, Paper 7.)*

A new analysis method for trace halogen gas in the atmosphere was established. Experiments were mostly conducted using chlorine gas. Clean air free of inorganic or organic gases, dusts, and water is mixed with a given concentration of mercury steam, and the mixture is passed through a quartz cell (20 cm), and another air cleaner, and is taken out. The average mercury concentration in the quartz cell is confirmed by a recorder attached to an atomic absorption spectrophotometer. The cock is switched and a sample air is lead into the system, and the mercury steam absorption reduction is read on the recorder. Examining the difference between the previous mercury steam concentration and the new figure, the chlorine level is obtained. By varying the ratio, it was confirmed that mercury steam and chlorine gas react at 1:1 mol ratio. The formed substance was captured on a glass slide. A chemical analysis revealed it was mostly mercurous chloride, though it could not be confirmed by X-ray diffraction. The effect of humidity on the reaction was examined. There was no reaction in the 15-60% relative humidity range. A calibration line was prepared and reliability was checked; the average 129 ppb standard error was 5.1 ppb. Interferences of coexisting gases were checked. At most, the effect of ozone is 0.003.

**40621** **APTIC NO. 64779**

Imagami, Kazunari

SELECTION OF MEASURING APPARATUS FOR AIR POLLUTANTS (2). *(Taiki osen busshitsu no sokuteiki no sentei). Text in Japanese. Kogyo Kanetsu (Ind. Heating), 11(2):82-88, March 1974. 1 ref.*

Measuring apparatus for analyzing air pollutants such as cadmium, lead, chlorine, hydrogen chloride, fluorine, hydrogen fluoride, hydrogen silicofluoride, nitrogen oxides, and other harmful substances are described. For heavy metals such as cadmium and lead, there are three methods, atomic absorption spectrophotometry, spectrometry, and polarography, each of which is accepted widely; atomic absorption spectrophotometry has, however, been most widely used. Emission spectrometry, X-ray fluorimetry, radiochemical analyzers, recently have attracted attention. Chlorine present in flue gas is mostly analyzed by the orthotolidine method in Japan, and hydrogen chloride is determined by the mercury thiocyanate method which is suitable for samples with a hydrogen chloride concentration of 2 to 40 ppm in cases where 40 l of sample gas are available and the effect of halide and cyanide is negligible. For fluorides in flue gas, spectrometry using a lanthanum-alizarin complex is adopted. Determination of nitrogen oxides in flue gas is done by the phenoldisulfonic acid method which is suitable for concentrations of about 10 to 20 ppm. The present general trend is toward using the PDS method, Rapid PDS method, chemiluminescence, and electrochemical methods.

**40622** **APTIC NO. 62913**

Johansson, T. B., R. Akselsson, and S. A. E. Johansson

X-RAY ANALYSIS: ELEMENTAL TRACE ANALYSIS AT THE 10 TO THE -12 G LEVEL. *In: Multi-Element Trace Analysis by Proton Induced X-ray Emission. Thomas B. Johansson (ed.), Lund, Sweden, May 20, 1974, Chapt. I, p. 1-3. 5 refs. (Also: Nucl. Instrum. Methods, vol. 84:141-143, 1970.)*

X-ray emission analysis can be used for assaying small amounts of trace elements. Using protons in the MeV region as an excitation source and a high resolution silicon(lithium) detector, X-ray analysis is capable of detecting many elements at the 10 to the -12th g level simultaneously. A series of experiments were performed to test this method. The material to be analyzed was deposited on a very thin carbon foil and placed in an irradiation chamber connected to the beam pipe of a Van de Graaff generator. A well-collimated proton beam transversed the sample, and the resulting X-rays were recorded by a silicon detector and a 4096 channel analyzer. In one experiment, the chemical composition of particulate matter in the air was measured. The theoretical lower limit of detection was calculated; the limit of detection obtained was 10 to the -11th power g, with minor improvements the 10 to the -12th g level can be reached, and theoretically 10 to the -15 power g is attainable.

**40623** **APTIC NO. 62915**

Johansson, T. B., R. Akselsson, and S. A. E. Johansson

PROTON-INDUCED X-RAY EMISSION SPECTROSCOPY IN ELEMENTAL TRACE ANALYSIS. *In: Multi-Element Trace Analysis by Proton Induced X-ray Emission. Thomas B. Johansson (ed.), Lund, Sweden, May 20, 1974, Chapt. III, p. 7-21. 16 refs. (Also: In: Advances in X-ray Analysis. Kurt F. J. Heinrich, Charles S. Barrett, John B. Newkirk, and Clayton O. Ruud (eds.), Vol. 15, New York, Plenum.)*

Using protons in the MeV range as the excitation source and a high resolution silicon (lithium) detector, X-ray emission spectroscopy was capable of analyzing many elements with Z greater than 15 simultaneously at the 10 to the -12th g level. The theoretical lower limit of detection at moderate proton energies is discussed. The technique was tested on the following applications: analysis of elemental composition of airborne particulates as a function of particle size, oil slick identification, water, and blood serum. Advantages of this method of trace analysis include the capability to determine most of the elements present in a single run, ability to use a simple calculation for calibration, and rather small variable in sensitivity between different elements. (Author abstract modified)

**40624** **APTIC NO. 62917**

Johansson, Thomas B., Rene E. Van Grieken, J. William Nelson, and John W. Winchester

ELEMENTAL TRACE ANALYSIS OF SMALL SAMPLES BY PROTON INDUCED X-RAY EMISSION. *In: Multi-Element Trace Analysis by Proton Induced X-ray Emission. Thomas B. Johansson (ed.), Lund, Sweden, May 20, 1974, Chapt. V, p. 35-55. 34 refs.*

Proton induced X-ray emission was developed for quantitative analysis of 12-15 elements simultaneously in small non-homogeneous samples such as impactor-collected aerosols size fractions using a low energy (3.7 MeV) proton beam from a Van de Graaff generator. The procedure is described in detail as are numerous tests of the performance of the system and the analytical methodology. Detection limits in a 10 min run are in the 10 to the -9th g range. The standard deviation amounts to 6% for the set-up and to 15% for the total analytical procedure. The method is absolute, since standards are used only to check the stability of the system. (Author abstract)

**40625** **APTIC NO. 62989**

Johnston, Harold S.

MOLECULAR MODULATION SPECTROMETRY FOR OBSERVATION OF FREE RADICALS (FINAL REPORT). *California Univ., Berkeley, Dept. of Chemistry, Environmental Protection Agency Grant 801120, ROAP 26 AAD, Task 12, Program Element A11008, Rept. EPA-650/4-74-004, 103p., March 1974. 68 refs.*

NTIS: PB 231174/AS

A molecular modulation spectrometric method for the determination of free radicals in photochemical reactions that are known to occur at light intensities equal to that of sunlight is described in terms of methodology and quantitative spectral and kinetic data obtained for chlorine oxide, chlorine peroxide, hydrogen peroxide, and nitric anhydride radicals. The method can measure radicals at concentrations as low as 10 to the 11 particles/cc, though it requires a large amount of time and effort; it is not recommended as a general method of kinetics due to the difficulty in obtaining data and should be used only for necessity of studying photochemical reactions under realistic atmospheric conditions.

**40626** **APTIC NO. 63254**

Kanagawa, Akira

PROBLEMS IN MEASUREMENT OF SUSPENDED PARTICULATES BY LIGHT SCATTERING. *(Kosanranho ni yoru fuyu funjin sokuteijo no mondaiten). Text in Japanese. Funtai Kogaku Kenkyu Kaishi (J. Res. Assoc. Powder Technol., Japan), 11(3):141-148, May 1974. 9 refs.*

Various methods for measuring suspended particulates are discussed and compared with the light scattering method. The use of microscopy is basically the opposite of light scattering, and measurement of particle shapes or sizes which requires microscopy cannot be achieved by light scattering. By the same token, the measurement of dust concentration time change which requires light scattering cannot be achieved by a microscope. Therefore, the selection of methods depends on the purpose. The weight method is direct, but it takes labor and time. Light scattering data requires calculation and a hypothesis for measuring weight and concentration of dusts. The settling and inertia methods both require a combined method of microscopy or measurement of weight, but are suitable for investigating aerodynamic characteristics. The static electricity and dispersion methods are effective for measuring microparticles. The light intensity distribution theory, photocounter type apparatus, light scattering particle counter, photometer measuring apparatus, and light scattering photometer are discussed. The structures, principles, characteristics and efficiencies of these are discussed with diagrams and graphs. The most important point to remember with light scattering is that the measurement represents the number of light bundles caused by light scattering, and when this value is converted into particle concentration, it does not really represent the value of particle concentration but that of light scattering.

**40627** **APTIC NO. 64674**

Kanagawa, Akira

MEASUREMEN OF AEROSOL BY LIGHT SCATTERING METHOD. *(Kosanranho ni yoru earozoru no sokutei). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 11:46-59, Jan. 1974. 7 refs.*

Aerosol measurements are used to investigate the chemical composition and physical form of atmospheric particles, particle size, and distribution concentration. No one method is adequate to cover all these areas, and theoretically, technically, and economically proper measurement methods should be selected according to the purpose of the measurement. Light scattering methods for the measurement of aerosol concentration and particle size are reviewed with theoretical description and characteristics. The most outstanding characteristic is that the measurement is made of particles in the suspended state, and simple, automatic, and continuous measurement procedures with instant results are possible. The light scattering method is classified into the photocounter method and the photometer method. The light scattered by individual particles is separately measured in the former and the total light scattered by numerous particles is measured in the latter. The theoretical characteristics of the scattering light intensity, Mie s theoretical equations, and the dependence of scattering light intensity on particle size parameters and particle refractive index are discussed. The mechanism, performance characteristics, and measurement procedures of photocounters and two types of photometer (one for concentration measurement and the other for average particle size measurement) are described.

**40628** **APTIC NO. 64675**

Karasawa, Yasuo

IDENTIFICATION AND QUANTITATION OF CARCINOGENIC HYDROCARBONS (I). *(Hatsugansei tanka suiso no teisei to teiryo (I)). Text in Japanese. Aromatikkusu (Aromatics), 26(4):183-184, 1974. 16 refs.*

Polycyclic hydrocarbons are combustion products of organic matter. Benzo-(a)-pyrene has been found in forest areas far from sources of industrial pollution, probably as a result of forest fires. Benzopyrene also selectively adsorbs on limestone. Analyses for polycyclic compounds determine the degree of pollution in the atmosphere (from domestic heat sources, industrial furnaces, automobile exhausts), lungs (from tobacco smoke), water (from industrial wastes contaminating mud and shellfish, especially littoral), and food coloring. Schabad has presented a method for determining benzopyrene concentrations of 0.01 with white paraffin. Filtration methods are necessary for studying polycyclic compounds in air and smoke. Methods and precautions are listed. Polycyclic compounds can be extracted by solvents. Solvents useful in Soxhlet extractions and liquid-liquid extractions are listed. Monkman opposes Soxhlet extraction of atmospheric dust because of possible destruction of polycyclic compounds in the application of heat in the presence of air and light.

**40629** **APTIC NO. 64812**

Karasek, F. W. and D. W. Denney

DETECTION OF 2, 4, 6-TRINITROTOLUENE VAPOURS IN AIR BY PLASMA CHROMATOGRAPHY. *J. Chromatog., 93(1):141-147, June 1974. 9 refs.*

Rapid detection and identification of picogram quantities of the vapors of 2, 4,6-trinitrotoluene (TNT) and related compounds in the air is possible using the technique of plasma chromatography. Operating at atmospheric pressure, the instrument uses either air or nitrogen carrier gas into which the sample is injected directly or through a simple gas chromatographic system. Identification is provided by the characteristic mobility spectra obtained. Both positive and negative mobility spectra for TNT and 2,4-dinitrotoluene are presented, and selective detection at ultra-trace levels is demonstrated. The plasma chromatograph gives simple, characteristic positive and negative mobility spectra for TNT and other nitroaromatic compounds in air. (Author summary modified)

**40630** **APTIC NO. 63178**

Kikuchi, Makoto, Yuzuru Unozawa, Akiyoshi Mori, Yoshitake Seiki, Kunio Takahashi, and Katsuyoshi Ito

STACK GAS ANALYZER SA-302. *(Endo gasu sokuteiki SA 302 gata). Text in Japanese. Mitsubishi Denki Giho Tokyo, 48(4):459-464, April 1974. 8 refs.*

Test data are given for a stack gas analyzer capable of monitoring simultaneously the stack gas concentrations of sulfur dioxide, nitric oxide, and nitrogen dioxide. The analyzer is based on the application of ultraviolet absorption. Data are given for the analyzer s specifications, absorption spectra obtained for the three gases, absorption coefficients at 226 millimicron, NO response interference by the other gases, tests involving the mixing of standard gases, and field testing of boiler stack gas. The analyzer is compared with conventional gas analyzers.

**40631** **APTIC NO. 64810**

Kirkbright, G. F. and C. G. De Lima

THE DETECTION AND DETERMINATION OF POLYNUCLEAR AROMATIC HYDROCARBONS BY LUMINESCENCE SPECTROMETRY UTILISING THE SHPOL SKII EFFECT AT 77 K. *Analyst (London), 99)1179):338-354, June 1974. 43 refs.*

The luminescence emission spectra of 23 polynuclear aromatic hydrocarbons (PAH) were examined in n-alkane solvents at 77 K. The Shpol skii effect, in which the narrow-band (quasi-linear) emission spectra are obtained under these conditions when a monochromator of adequate resolving power is used, was readily observed for 12 of the compounds examined in these solvents. Quasi-linear emission spectra were also obtain in tetrahydrofuran for some of the PAH compounds examined. These emission spectra provided for unambiguous qualitative identification of PAH compounds at trace concentrations in solution; this effect was demonstrated by identification of the compounds present in an eight-component mixture of PAH compounds. Measurement of the low-temperature quasi-linear luminescence intensity can be applied quantitatively to the determination of these compounds, provided that a standard additions procedure is employed in conjunction with the use of an internal standard to ensure sufficient accuracy and precision. (Author abstract)

**40632** **APTIC NO. 63313**

Kitamoto, Asashi and Yoichi Takashima

DEPOSITION RATE OF AEROSOL PARTICLES FROM TURBULENT FLOW THROUGH VERTICAL ANNULI. *Bull. Tokyo Inst. Technol., no. 121:67-82, March 1974. 7 refs.*

The particle deposition velocity onto walls of an annular duct was numerically estimated by means of a transport model of aerosols. The turbulent velocity profile and its eddy diffusivity distribution were assumed in some reasonable forms according to the similarity with those characteristics of turbulent flow in a circular pipe. When the eddy diffusivity of momentum determined by Lin was assumed in wall regions of the annular pipe, the most reliable results compared with the experimental data were predicted in the particle diameter range from 0.1 to 5 micron by the numerical analyses based on the effective eddy diffusivity model of the particle. This analysis can be applied to the particle deposition in a sampling probe and its sampling line in order to obtain accurate sampling. (Author conclusions modified)

**40633** **APTIC NO. 60991**

Knight, G., T. E. Newkirk, and G. R. Yourt

FULL-SHIFT ASSESSMENT OF RESPIRABLE DUST EXPOSURE. *Can. Mining and Met. Bull. (Montreal), 67(744):61-72, April 1974. 26 refs.*

The need for, the historial development of, and the research studies on instrumentation for full-shift sampling of respirable dust in metal mines are described. Extensive recent research and field testing resulted in the development of instruments and methods that more accurately assessed the health hazard from exposure to respirable dust than current practices. The gravimetric respirable dust sampler worn by a worker or operated in a fixed position nearby was effective and convenient for collecting a single sample over an entire shift. From this sample, the total mass, the quantity of quartz, and other particulates such as diesel smoke were determined. For high-quartz mines where the weight of samples was necessarily small, direct measurement of quartz on filters by x-ray diffraction was more accurate and suitable than weighing. Konimeter samples in the range of 200-300 ppcc, taken simultaneously with a gravimetric sampler in high-quartz mines, corresponded with 0.1 mg/cu m of quartz in the ACGIH mass formula (TLV equals 10/% respirable quartz + 2 (in mg/cu m)). Filters from samplers worn by workmen yielded higher readings of respirable dust than those from samplers in fixed positions nearby. When two gravimetric samplers were worn by the same miner, with one cyclone and one filter attached to the lapel and the other to the cap-lamp battery, readings were sufficiently similar to warrant adopting the latter arrangement. The cooperation of miners in wearing samplers was very good; very few samplers were spoiled. Problems encountered in the operation of samplers were minor. Some were eliminated in the new units incorporated with the cap-lamp battery. (Author abstract modified)

**40634** **APTIC NO. 63323**

Kojima, Shigeyoshi, Hiromi Yoshida, Kenya Goto, Yoshio Sakamoto, and Hiroichi Kimura

AIR POLLUTION OBSERVATION WITH COMPACT LASER RADAR CAR. *Toshiba Rev., no. 90:21-25, March-April 1974. 8 refs.*

Operation, equipment layout, and air pollution measurement results are described for a compact laser radar car employing a high repetition rate pulsed laser. A niobium-doped crystal is pulse-pumped by a xenon flash lamp and generates infrared energy of 1.06 micron wavelength which is highly monochromatic, essentially coherent, and is concentrated in very short, high power giant-pulses by the use of a Q-switched optical resonator. The energy is directed to the atmosphere without any refracting or reflecting optical system since the beam divergence is narrow (1 mrad). Energy backscattered by the atmosphere within the beam is detected by a photomultiplier tube after being collected by an optical receiver system. The laser car with the 100 pulses per second laser is very useful for atmospheric observations, especially for observations of inversion layers, without any restriction in operating time and space. The Mie-scattering signals contain much useful information from wind, haze, mist, fog, smoke, and clouds. Detection of the inversion layers and the suspended particulates using this type of laser radar car might be very effective for forecasting a heavy smog generation or a photochemical smog generation due to the fact that the observation can be made continually in real time.

**40635** **APTIC NO. 63160**

Kol kovski, P. G. and Y. D. Kavakova

EXPRESS METHOD FOR THE DETERMINATION OF BI-58 AND PHOSALONE IN THE AIR. *(Ekspressnyy metod opredeleniya BI-58 i fozalona v vozdukhe). Text in Russian. Gigiena i Sanit., no. 4:83-86, 1974.*

A simple, rapid method for the colorimetric determination of BI-58 and phosalone, pesticides widely used in agriculture, in the air is described. Air is sampled through Whatman 1 paper coated with silica gel with a specific surface of 500-600 sq m/g and a particle size of 0.1-0.15 mm. Organic dyes additionally oxidized with bromine (brilliant green in 0.1% alcoholic solution for BI-58, an/ 0.5% solution of bromothymol blue for phosalone) were used for the colorimetric determination. The absorption maxima of brilliant green and bromothymol blue are at 482 nanom and 620 mm, respectively. The sensitivity of the method amounts to 0.5 microgram/l with a maximum error of + or - 20%.

**40636** **APTIC NO. 64934**

Koshi, Shigeji

RECENT TENDENCIES IN MEASUREMENT OF SUSPENDED PARTICLES AND A FEW CURRENT PROBLEMS. *(Fuyu ryushi-jo busshitsu no sokutei ni mirareru saikin no keiko to 2,3 no mondai). Text in Japanese. Funtai Kogaku Kenkyu-Kaishi (J. Res. Assoc. Powder Technol. Japan.), 11(3):138-140, May 1974.*

Standardization of measurement methods of suspended particles is discussed. Advantages and disadvantages of mass concentration methods, number concentration methods, and relative concentration methods are given. Mass concentration is the basic method for indicating concentration because of improvements in membrane filters. One of the most unique ideas adopted recently is to measure mass concentration after removal of rough particles. There is a lack of basic knowledge about aerosol technology which hinders present measurement theory.

**40637** **APTIC NO. 64801**

Kurihara, Chikara and Norihiko Fukuda

METHODS OF ANALYZING AIR POLLUTANTS IN THE RUBBER INDUSTRY. *(Gomukogyo ni okeru taikiosenbusshitsu no bunsekihoho). Text in Japanese. Nip-*

*pon Gomu Kyokai-shi (J. Soc. Rubber Ind. Jap.), 47(1):47-59, Jan. 1974. 13 refs.*

The rubber industry produces flue gases from disposal of wastes, boilers, vulcanizers, and other areas. The incinerator flue gases contain sulfur oxides, nitrogen oxides, hydrogen chloride, chlorine, fluorine, and dust. Analytical methods for these pollutants are listed in Japanese standards. The sampling method is important to ensure accurate monitoring. Precautions for soot and dust collection are described. Precautions for the measurement of moisture and gases present in flue gases, for measurement of temperature, static pressure, and dynamic pressure of flue gases at each measuring spot, and for the analytical methods are described.

**40638** **APTIC NO. 63213**

Landau, Julian I. and E. E. Peterson

A RAPID GC METHOD FOR ANALYZING NITRIC OXIDE REDUCTION PRODUCTS IN A SINGLE SAMPLE. *J. Chromatog. Sci., 12(6):362-365, June 1974. 7 refs.*

The need for a rapid method of analyzing all of the reactants and products of the reduction of nitric oxide by hydrogen and ammonia was realized during heterogeneous catalytic reaction studies in a transient reactor. A two-column gas chromatographic system using a thermal conductivity detector was developed to analyze for hydrogen, nitrogen, oxygen, nitric oxide, ammonia, and nitrous oxide from a single sample without using temperature programming. Severe tailing of the NH3 peak restricted quantitative analysis of NH3 to above 2500 ppm with the switching procedures employed. Other components can be analyzed below 400 ppm. Analysis of water was not possible. Total analysis time for the six-component system was only 11 min. Possible analysis of carbon monoxide and carbon dioxide is discussed. Although the CO peak is fairly well characterized, its retention time would increase total analysis time for each sample by 30%. Carbon dioxide analysis is not possible if NH3 is present since the two peaks overlap. (Author abstract modified)

**40639** **APTIC NO. 63380**

Lillian, Daniel and Hanwant Bir Singh

ABSOLUTE DETERMINATION OF ATMOSPHERIC HALOCARBONS BY GAS PHASE COULOMETRY. *Anal. Chem., 46(8):1060-1063, July 1974. 4 refs.*

Gas phase coulometry is evaluated and used to measure ambient halocarbons (halogenated hydrocarbons) in the New Brunswick, New Jersey area. Ionization efficiencies determined for 14 compounds range from less than zero to 90%. Reciprocal efficiencies are verified to increase linearly with flow rate as predicted by a stirred tank reactor model. The percent error in the coulometric analysis is less than 5% at efficiencies greater than 90% as compared to primary standards. Concentrations and chromatograms are presented for the following compounds measured coulometrically in the New Brunswick area: methyl iodide, trichloroethane, carbon tetrachloride, trichloroethylene, and tetrachloroethylene. (Author abstract modified)

**40640** **APTIC NO. 64704**

Lim, W. G. and G. K. Hann

SPOT SAMPLING OF STACK GASES - A NEW APPROACH. *Pulp Paper Can., 75(7):T255-T258, July 1974. (Presented at the Canadian Pulp and Paper Association, Air and Stream Improvement Conference, 8th, St. Andrews, New Brunswick, Sept. 11-13, 1973.)*

The stack gas sampling program at the Northwood kraft pulping plant is described. It has progressed from the accepted method involving insulated, heated glass containers, a vacuum pump, and conditioning times of up to an hour or more, to a simple 5-minute affair requiring not much more than a 500-milliliter Teflon bottle and a pocket big enough to hold it. Measurements of sulfur dioxide, hydrogen sulfide, and other reduced sulfur compounds are no longer complicated by considerrtions of sample loss through adsorption or of poor reproducibility of results. The sampling method described, now in full-time use, is rapid and simple, yielding results which are felt to be at least as reliable as those obtained by any other method in popular use. The time required per sample is short enough that there seems to be no real problem in achieving the eventual goal of sampling and measuring all 17 stacks routinely on a daily basis. (Author summary modified)

**40641** **APTIC NO. 63217**

Lynch, John J. and William A. Burgess

A PERSONAL EXPOSURE SAMPLER FOR CARBON MONOXIDE. *Am. Ind. Hyg. Assoc. J., 35(6):354-358, June 1974. 7 refs.*

The catalytic oxidation of carbon monoxide to carbon dioxide in air by Hopcalite is the basis for a personal sampler for CO. The laboratory and field performance of the sampler are reviewed. Four- or eight-hour integrated samples are obtained by drawing air at 0.5 l/min through stripping beds of Ascarite and molecular sieve which remove water vapor and CO2 present in the ambient air. The air sample then passes to a preweighted glass U-tube which contains Hopcalite, Ascarite, and anhydrous magnesium perchlorate. After sampling, the U-tube is reweighed; the increase in weight is due to the trapped CO2 from the oxidized CO. At 0.5 l/min and 70 F, the 1.5 g of catalyst in the U-tube converts more than 90% of the CO to CO2. For a 4-hour sample in the range of 20 to 100 ppm CO, the relative standard deviation of duplicate measurements is + or - 6%. (Author abstract modified)

**40642** **APTIC NO. 64904**

Marple, Virgil A. and Benjamin Y. H. Liu

CHARACTERISTICS OF LAMINAR JET IMPACTORS. *Environ. Sci. Technol., 8(7):648-654, July 1974. 15 refs.*

Characteristics of rectangular and round laminar jet impactors, used for the collection of airborne particles for subsequent gravimetric or chemical analysis, are determined by the numerical solution of the Navier-Stokes equations and the equation of motion of the particles. The numerical method is verified by comparing the predicted point of particle impact with impact points determined experimentally. Jet throat length appears to have a negligible influence, while the Reynolds number has a substantial effect below a value of about 500. The effect of the jet-to-plate distance is small above a value of 1.5 jet widths and 1.0 jet diameter for the rectangular and round impactors, respectively. Design of actual impactor is recommended with jet-to-plate above these critical values to ensure that slight changes in this distance will not sigificantly influence the cut-off particle diameter of the impactor. (Author abstract modified)

**40643** **APTIC NO. 63157**

McDaniel, Milton and Philip W. West

MICRODETERMINATION OF MANGANESE IN AIRBORNE PARTICULATE SAMPLES BY MEANS OF THE RING-OVEN TECHNIQUE. *Anal. Chim. Acta, 70(2): 482-484, 1974. 15 refs.*

The ring-oven technique was tested as a method of determining manganese concentrations in air. Ammonium acetate was used to fix iron as the basic acetate and to mask chromium and eliminate its interference. Sodium cyanide complexed the cobalt and copper, and silver or thallium were precipitated by hydrochloric acid. The effect of interfering ions was investigated by preparing two rings for each ion. The determination was performed directly on the sample spot on the collecting tape. Benzidine was used as the spot test reagent for manganese. Whatman 41 paper was used because of its purity and diffusion properties. The method combined paper chromatography and the ring-oven. This method was rapid, sensitive, reliable, and inexpensive.

**40644** **APTIC NO. 63175**

McKinley, J. J.

HOW TO CALIBRATE AMBIENT AIR MONITORS. *Instrum. Technol., 21(6): 45-49, June 1974. 7 refs.*

Four techniques are described for the calibration of continuous ambient air monitors. The first technique involves coulometric generators which generate precision calibration gas mixtures; the method, however is not drift-free except when careful attention is given to the operating technique used. The second method involves calibration by quantitative reaction of a stable mixture to dynamically prepare an unstable, highly reactive mixture. The technique is widely used for calibrating ozone monitors and for preparing nitrogen dioxide mixtures by ozone oxidation of nitric oxide. Another technique involves blending calibration mixtures by exponential dilution. The technique is extremely versatile since the contamination can be virtually any pure gas or stable, known mixture of gases or any readily vaporizable liquid. A fourth calibration method uses permeation tubes which constantly emit a very small, highly reproducible, and accurately controllable flow of contaminant gas generated directly from the pure contaminant fluid. Exponential dilution and constant emission blending methods are of particular interest for environment monitoring applications.

**40645** **APTIC NO. 64882**

Melzer, Werner

PROBLEMS OF AUTOMATIC TRACE GAS MEASUREMENT IN WASTE GAS AND VENT AIR CONTROL IN CHEMICAL PLANTS. *(Probleme der automatischen Gasspurenmessung bei der Abgas- und Raumluft-Ueberwachung in chemischen Produktionsanlagen). Text in German. Chem. Ing. Tech., 46(11):461-466, June 1974. 8 refs.*

The problems and uses of automatic trace gas monitoring and measuring systems in chemical plants are described. Glass and PTFE are especially suitable as construction materials for the measurement and sampling of aggressive gases and vapors. The analytical instrument is successively switched to the different sampling lines, each of which has its own pump. In a chemical plant, traces of chlorinated hydrocarbons were permanently monitored with respect to their maximum allowable concentrations by means of a Siemens process gas-chromatograph with three identical columns, and a flame ionization detector using hydrogen as carrier gas. The Hartmann und Braun Ionoflux was used for the measurement of chlorine concentrations in waste gases after scrubbing by means of sodium hydroxide solution. Traces of NaOH had to be separated from the test gas. A Phosgene monitoring and alarm system incorporated a Billion-Aire analyzer measuring the phosgene concentration as a function of the attenuation of alpha-rays by the aerosol formed by phosgene with diethylamine. Interferences due to hydrochloric acid were eliminated by adsorption on silver sulfate.

**40646** **APTIC NO. 63179**

Mizuta, Hajime and Norio Kimura

ON THE SEPARATION OF COARSER PARTICLE (10 MICRONS CUT) BY AN AIR SAMPLER. *(Ea sanpura ni okeru sodai ryushi bunri (10 mikuron katto) ni tsuite). Text in Japanese. Funtai Kogaku Kenkyu Kaishi (J. Res. Assoc. Powder Technol., Japan), 11(3):4-9, May 1974. 9 refs.*

Particle classification performance (for 10 micron cut) is described for various types of classifiers which can be attached to air samplers. Fractional separation efficiency is used to compare the accuracy of separation. Some dispersion is shown for the ratios of cut concentration to concentration containing the coarser particles. A reasonable value of mass penetration is observed with an air sampler-classifier designed for 10 micron, 50% critical particle size. The centrifugal type classifier is found practical for such applications. (Author abstract modified)

**40647** **APTIC NO. 64727**

Murai, Shunji, Yoichi Kato, and Yasuhiro Yoshida

A STUDY ON THE ENVIRONMENTAL CHANGES IN TOKYO DISTRICTS USING EARTH RESOURCES TECHNOLOGY SATELLITE IMAGERY. *(Chikyu shigen tansa eisei shashin o mochiita shuto-ken no kankyo chosa). Text in Japanese. Seisan-Kenkyu (Prod. Res.), 26(3):89-99, March 1974. 3 refs.*

Imagery transmitted by the Earth Resources Technology Satellite on changes in Tokyo districts concerning air pollution and distribution of greenery is analyzed. Satisfactory imagery was obtained in the winter season when some of the smog is abated. Multispectral photographs having four different spectral ranges in wavelength are presented. Four photographs taken on different days of the air pollution by smog emitted from seaside industries adjacent to the Tokyo Bay are reviewed. Smog flowed from the Keihin Industrial area and another mass of smog flowed from the seaside industrial area in Chiba Prefecture, forming a big mass of smog in the Tokyo Bay.

**40648** **APTIC NO. 63289**

Musashino, Hideo

MEASUREMENT OF CARDINAL NUMBER OF DUST AS PARTICLES. *(Kosanran ni yoru fuyuryushijo busshitsu no nodo sokutei). Text in Japanese. Funtai Kogaku Kenkyu-kaishi (J. Res. Assoc. Powder Technol., Japan), 11(3):50-51, May 1974.*

The Japanese standard for respirable dusts regulate particles with a radius of less than 10 micron to 0.1 mg/cu m/hr as the mean value, and 0.2 mg/cu m/hr as the maximum value. Measurement methods include light scattering, digital dust counters, and low-volume air samplers.

**40649** **APTIC NO. 63262**

Neustadter, Harold E. and Steven M. Sidik

ON EVALUATING COMPLIANCE WITH AIR POLLUTION LEVELS NOT TO BE EXCEEDED MORE THAN ONCE A YEAR. *J. Air Pollution Control Assoc., 24(6):559-563, June 1974. 11 refs.*

The recommended sampling frequency for meeting the Environmental Protection Agency air quality standards is discussed. A critique is presented of the calculation procedures for estimating the corresponding ambient pollution level when a sampling program is operating in conformity with EPA guidelines, once every 3-6 days. Quantitative consideration is given to the questions of statistical independence of the data, commutativity of expectation and exponentiation operations, and the statistical variability of the calculated results. Monte-Carlo simulations were performed which indicate a 95% confidence interval of + or - 56% at 60 samples/yr and + or - 40% at 120 samples/yr. Sampling frequencies every third to sixth day are inadequate for determining conformity with standards expressed as levels not to be exceeded more than once per year. (Author abstract modified)

**40650** **APTIC NO. 63258**

O Shea, Donald C. and Lee G. Dodge

NO2 CONCENTRATION MEASUREMENTS IN AN URBAN ATMOSPHERE USING DIFFERENTIAL ABSORPTION TECHNIQUES. *Appl. Opt., 13(6):1481-1486, June 1974. 15 refs.*

The absorption coefficients of nitrogen dioxide for the output wavelengths of a mercury lamp and an argon-ion laser were measured and are reported. Beer s law was obeyed over the regions observed. Simultaneous measurements of two wavelengths with different absorption coefficients for the gas of interest should enable one to distinguish between the attenuation due to absorption from that due to refractive index scattering. In the comparison of the intensity attenuation for two wavelengths, the variation of the absorption coefficient with wavelength must be large compared to the variation of the scattering attenuation coefficients (for the several scattering processes) with wavelength. This criterion is satisfied for the absorption of light by NO2 at various places in the region 400-550 nm. The absorption coefficient multiplied by the gas concentration is large compared to similar products of coefficient times concentration for other atmospheric constituents for NO2 in the troposphere for the two argon-ion laser lines (496.5 nm and 501.7 nm) used in this study. A low average power, inexpensive, nonhazardous pulsed laser with a signal-to- noise ratio equivalent to a continuous-wave laser system operating at the peak power of the pulsed layer can be used. The differential absorption of argon-ion laser lines by NO2 was measured in the urban air of Atlanta, Georgia. A simplified detection system using the differential absorption is proposed for simultaneous measurements. The light absorption detection method is capable of monitoring diurnal variations of NO2. (Author conclusions modified)

**40651** **APTIC NO. 63176**

Okada, Takashi and Susumu Kitani

SOME STUDIES OF LIGHT-SCATTERING MEASUREMENTS OF AEROSOL PARTICLES. *(Funjin no kosanran sokutei ni okeru 2, 3, no mondai). Text in Japanese. Funtai Kogaku Kenkyu Kaishi (J. Res. Assoc. Powder Technol., Japan), 11(3):163-169, May 1974. 12 refs.*

Recent studies are outlined demonstrating the applicability of light-scattering for the examination of aerosol particles. The following three problems are examined on the basis of theoretical computation of light scattering intensities and some additional experiments: determination of size distribution by measuring the intensity of scattered light at three angles for a fixed wavelength of the incident beam, determination of number concentration by measuring the absolute angular scattering intensities with a standard opal glass diffusor, and direct estimation of approximate weight concentration from the measurements of angular scattering intensities. (Author abstract modified)

**40652** **APTIC NO. 63327**

Okita, Toshiichi

PRECISION IN THE MEASUREMENT OF AIR POLLUTANTS. *(Taiki osen sokutei ni okeru sokuteichi no seido). Text in Japanese. Funtai Kogaku Kenkyu Kaishi (J. Res. Assoc. Powder Technol., Japan), 11(3):159-162, May 1974. 4 refs.*

The errors in the measurements of particle weight or concentration by filter paper permeation can be caused by the fluctuation of the filter paper weight or the flow rate at the time of sampling. The degree of accuracy further decreases when measuring sulfuric acid ion or metal composition in the samples. Also, different parts of the same filter paper can yield greatly different measurements. Variation coefficient, reliability, and population mean versus measurement average are discussed. When measuring pollutants in the air, the sampling location must be carefully selected and all the environmental effects such as local pollution emission sources, meteorological effects, and topographical effects must be eliminated. The measurements of suspended particulates on the third floor of a high building can differ by as much as 130 micrograms/cu m depending on the direction and lea of the wind, and on the fifth floor, they can differ by 100 microgram/cu m. In general, measurements of settling particles and high vol sampler tests are more accurate on 2nd-4th floor of a concrete building than on the ground level. The variation coefficient in Tokyo for the digital dust counter is 26, for the tape air sampler is 19, the impactor type sampler is 40, and the nephelometer is 14. The question is particularly sensitive when determining whether a measurement is above or below the environmental standard. The method of calculation of errors and averages is discussed mathematically.

**40653** **APTIC NO. 64707**

Okuno, Toshihide

EXAMINATION OF ODOR CONDITION INVESTIGATIONS AND MEASUREMENT METHODS. *(Akushu jittai chosarei oyobi sojuteiho no kento). Text in Japanese. Akushu no Kenkyu (Odor Research J. Japan), 3(14):13-18, March 1974.*

To gather pollution data necessary for the establishment of the environmental standard for odors, the concentrations of ammonia, trimethylamine, methyl mercaptan, methyl sulfide and hydrogen sulfide were measured at one refuse incinerator, three sewage plants, six poultry farms, four pig farms, and four dairy farms November 1972 through January 1973. Several measurements were made at two to three points within each establishment. The concentration ranges of each pollutant are given. The sulfuric acid filter paper method was used for collecting samples for NH3 and C3H9N determination. Often more than 10 types of alkyl amines are contained in air, and the separation of such alkyl amines by gas chromatography is very difficult. Using TEP column, mono-, di- and trimethyl amines can be separated; however, the separation of methylamine from ethylamine is unsatisfactory. The low temperature concentration method was used for collecting samples for organic and inorganic sulfur compounds determination. To separate CH4S, C2H6S, and H2S from a number of S compounds, silica gel and TCP columns were used. The stability of S compounds in solvent was tested. Solutions of CH4 and C2H6S were sufficiently stable for making measurements for calibration curve. The H2S dissolved in water is extremely unstable. Therefore, the nitrogen gas was used for dilution. The variations in concentration of standards solutions and S compounds in sampling bottles with time are shown in diagrams.

**40654** **APTIC NO. 63140**

Olmez, I., N. K. Aras, G. E. Gordon, and W. H. Zoller

NONDESTRUCTIVE ANALYSIS FOR SILICON, RUBIDIUM, AND YTTRIUM IN ATMOSPHERIC PARTICULATE MATERIAL. *Anal. Chem., 46(7):925-937, June 1974. 8 refs.*

The nondestructive analysis for silicon, rubidium, and yttrium in atmospheric particulate material by instrumental photon activation analysis (IPAA) is described. Samples of atmospheric particulate matter were collected on the roof of the six-story chemistry building on the University of Maryland College Park campus by pumping about 2500 cu m of air through polystyrene filters. The IPAA method depends strongly on the amounts of other elements present whose radiation products have gamma rays that interfere with those of the species of interest and upon the blank levels of the filter material. The technique for Si is particularly useful because of the very short irradiation and the counting times required. The turn around time from the start of irradiation to final answers is about 15 min with a pulse height analyzer that integrates peaks. Silicon is an important element to measure in atmospheric particulates as about 30-80% of the mass of particulates collected in most areas consists of crustal material that is mainly alumino-silicates. By determining both aluminum and Si, the Al:Si ratio can be obtained to provide much information about the origins of the alumino-silicates.

**40655** **APTIC NO. 63168**

Osina, S. A.

DETERMINING DIMETHYLFORMAMIDE IN AIR. *(K opredeleniyu dimetilformamida v vozdukhe). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 3:56-57, 1974. 3 refs.*

The optimum conditions of the colorimetric and spectrophotometric determination of dimethylforamide in air were studied. Air was sampled through two absorbers containing 5 ml distilled water each at a rate of 1 l/min for 6 to 8 min. The samples then are combined with 0.5 ml 12% solution of hydroxylamine hydrochloride and 1 ml 5n-solution of sodium hydroxide, after which 30 min are allowed for the reaction to occur. One ml 5n-hydrochloric acid and 0.5 ml 25% ferric chloride are then added. The resulting yellowish-brown color is compared with that of a reference solution. The sensitivity of the method amounts to 0.01 mg in the sample volume. Spectrophotometric determination at 195 nanom is possible in a concentration range of 0.1-1 micrograms/ml.

**40656** **APTIC NO. 63083**

Oxborrow, G. S., A. L. Roark, N. D. Fields, and J. R. Puleo

MATHEMATICAL ESTIMATION OF THE LEVEL OF MICROBIAL CONTAMINATION ON SPACECRAFT SURFACES BY VOLUMETRIC AIR SAMPLING. *Appl. Microbiol., 27(4):706-712, April 1974. 11 refs.*

The mathematical estimation of the level of microbial contamination on spacecraft surfaces by volumetric air sampling was investigated. The number of viable cells per viable particle on both membrane filters and stainless steel strips was compared. Parameters necessary for the mathematical model are the effect of angled surfaces on viable particle collection and the number of viable cells per viable particle. Deposition of viable particles on angles surfaces closely followed a cosine function, and the number of viable cells per viable particle was consistent with a Poisson distribution. Other parameters considered by the mathematical model included deposition rate and fractional removal per unit time. A close nonlinear correlation between volumetric air sampling and airborne fallout on surfaces was established with all fallout data points falling within the 95% confidence limits as determined by the mathematical model. (Author abstract modified)

**40657** **APTIC NO. 64830**

Pal, Karolyne

ANALYTICAL METHODS FOR THE ASSESSMENT OF SMOKE GENERATED DURING THE COMBUSTION OF PLASTIC MATERIALS. *(Vizsgalati modszerek muanyagok egesekor keletkezett fust megitelesere). Text in Hungarian. Muanyag Gumi, 11(4):117-121, 1974. 7 refs.*

Standard methods for the evaluation of smoke formation and smoke density occurring during the combustion of plastic and other materials are surveyed. According to the ASTM D 2843-70 (Rohm and Haas) method, light absorption by the smoke formed from burning plastic material specimens is recorded at 15 second intervals; the moment in which an illuminated EXIT sign becomes invisible is also recorded. The NBS method, expected to be standardized in the near future, permits the determination of the specific optic density and of the Smoke Obscuration Index. According to DIN 53436 and DIN 53437, the smoke optic density is measured in a quartz tube at 30 sec intervals for at least 10 min. In a French method, the light source is opposed by a rotating black-and-white disc rather than the electric eye, and the smoke density is determined from the attenuation of the light reflected from the white portion of the disc, and from the scattered light from the black segment. While wood generates more smoke and soot under the effect of radiant heat, plastic materials release most smoke when exposed to open flame with and without radiant heat.

**40658** **APTIC NO. 64834**

Peperstraete, H.

EVALUATION OF ANALYZERS FOR CONTINUOUS AIR POLLUTION MEASUREMENT. *(Evaluatie van analyse apparatuur voor continu meting van luchtverontreiniging). Text in Dutch. Tribune CEBEDEAU (Centre Belge Etude Doc. Eaux), no. 364:119-128, March 1974.*

A calibration unit for air pollutant analyzers, as well as instruments and methods for the continuous, automatic, and autonomous monitoring of air pollutants are described. The calibration unit, suitable for the injection of 6 different gaseous pollutants, uses a permeation nozzle, nitrogen as carrier gas at 30 C, a molecular sieve, and a flow meter for instrument calibration. Comprehensive tests of different continuous, automatic analytical methods with special regard to sulfur dioxide and nitrogen oxides monitoring revealed that colorimetric, conductometric, flame-photometric, and coulometric methods are most suitable for autonomous instruments, while conductometric, coulometric, flame-photometric, and possibly colorimetric methods excel by high selectivity.

**40659** **APTIC NO. 64888**

Peperstraete, H.

MEASUREMENT TECHNIQUE FOR NITROGEN OXIDES IN THE AIR. *(Meettechnieken voor stikstofoxiden in de lucht). Text in Dutch. Ingenieursblad, 43(10):337-338, 1974.*

The formation and techniques for the determination of nitrogen dioxide and nitric oxide are described. Nitric oxide is formed at high temperatures, during the decomposition of nitric acid and nitrates, and is easily oxidized to NO2. Direct spectrophotometric methods are suitable for the determination of atmospheric NO2. Under laboratory conditions, it can be determined by means of gas chromatography with an electron capture detector. Both NO2 and NO can be determined as nitric acid following absorption in water containing hydrogen peroxide. Thynitric oxide obtained is determined either by acid titration or colorimetrically, using phenoldisulfonic acid. For spectrophotometric determination, NO2 is absorbed and reacted to nitrate, and is determined by its interaction with amines, e.g., alpha-naphthylamine and sulfanilic acid according to Griess method, or by means of N1-EDA and sulfanilic acid according to the Saltzman method. The Jacobs-Hochheiser method applies sodium hydroxide for absorption, and the sodium nitrite obtained is diazotized. The NO can be determined by chemiluminescence by measuring the photon generated during its ozone-induce oxidation to NO2, while NO2 can be determined during its reduction to NO. The reduction to NO is best conducted at 200 C in the presence of a catalyst. The chemiluminescent method is applicable in a concentrations range of 0-10,000 ppm.

**40660** **APTIC NO. 63390**

Quarles, John

REGULATIONS OF FUELS AND FUEL ADDITIVES: LEAD AND PHOSPHORUS TEST PROCEDURES. *Federal Register, 39(131):24890-24893, July 8, 1974.*

Appendices are added to 40 CFR Part 80 prescribing test methods for trace lead and phosphorus in gasoline, to be used to enforce the trace lead and phosphorus levels required by EPA regulations for lead free gasoline. Standardized test methods were developed by the American Society for Testing and Materials (ASTM). The lead and phosphorus content of gasoline shall be determined in accordance with the test methods set forth, which are essentially identical to ASTM Method of Test for the Determination of Phosphorus in Gasoline, D3231-73, and the Standard Method of Test for Lead in Gasoline by Atomic Absorption Spectrometry, D3237-73.

**40661** **APTIC NO. 63230**

Rao, M. Mukunda and C. Suryanarayan

DETECTION OF REMOTE AIR POLLUTION USING LASERS. *J. Inst. Engrs. (India) (Calcutta), vol. 54:65-67, Jan. 1974. 4 refs.*

Applications of lasers in the detection of remote air pollution are reviewed. The advantages of these techniques over the conventional ones based on chemical analysis include instantaneous detection of pollutants with an accuracy of a few ppb and the fact that the entire test equipment can be quite far away from the actual site of pollution. Two methods based on Raman backscattering and resonance absorption are discussed and compared. The different design considerations for an electronic system based on Raman backscattering are discussed including the photo detection system and the electronic data processor. (Author abstract modified)

**40662 APTIC NO. 64886**

Renoux, A., J. F. Butor, and G. Madelaine

ELECTRON MICROSCOPIC DETERMINATION OF THE GRANULOMETRIC DISTRIBUTION OF ATMOSPHERIC AEROSOLS WITH RADII FROM 0.0035-1 MICRON. *(Determination de la repartition granulometrique, par microscopie electronique, des aerosols atmospheriques de rayons compris entre 3.5 10-3 um et 1 um). Text in French. Chemosphere, 13(3):119-122, June 1974. 6 refs.*

A procedure for the air sampling and electron microscopic determination of the granulometric distribution of aerosol particles with radii of between 0.0035 and 1 micron, and actual measurements carried out at Brest, 2 km from the seashore, are described. Air was sampled through an 8-stage Andersen cascade impactor and nucleopore filter with a pore size of 0.4 micron. Only the aerosol particles retained on the glass plates of the seventh and eighth stages of the cascade impactor were investigated under the electron microscope. The investigation of air samples taken in Brest, a city with low pollution levels, demonstrated a concentration maximum at radii of 0.05-0.06 micron, and a minimum at radii of 0.025 micron, along with an increase toward finer particles. Even though the smallest aerosol particles very rapidly adhere to larger particles due to thermal coagulation, the contribution by particles formed from gaseous air pollutants (such as sulfur dioxide, nitrogen oxides, ammonia and hydrocarbons) is significant, even in non-polluted atmospheres. Possibilities of the continuous formation of very small particles, and of the non-instantaneous binding of the fine particles by the largest particles were demonstrated.

**40663 APTIC NO. 63378**

Ridley, B. A. and L. C. Howlett

AN INSTRUMENT FOR NITRIC OXIDE MEASUREMENTS IN THE STRATOSPHERE. *Rev. Sci. Instr., 45(6):742-746. June 1974. 9 refs.*

A completely automatic chemiluminescent instrument has been developed for in situ measurements of nitric oxide in the stratosphere. Signal intensity is linear in NO. Typical responsivity at 21.3 km is 1860 counts/sec ppbv. With a 1-sec measuring time constant, the detection limit as determined by noise is 0.03 ppbv. The instrument has been flown from balloon platforms to 30.8 km and from aircraft platforms between 12.2 and 18.3 km. Data for these flights are given.

**40664 APTIC NO. 63267**

Robinson, J. W. and J. L. Guagliardo

NON-SELECTIVE REMOTE- SENSING OF ORGANIC POLLUTANTS BY LASER INDUCED IR FLUORESCENCE. *Spectrosc. Lett., 7(2):121-130, 1974. 9 refs.*

The application of laser induced infrared fluorescence to remote sensing of molecular air pollutants was investigated. The fluorescence signal greatly decreased when the tunable laser was used. The background radiation was orders of magnitude greater than the induced fluorescence. A distinct diurnal variation in fluorescence intensity was observed when the laser beam was shone over a university car park. There was a steady increase in fluorescence intensity as automobile traffic arrived at the university, reaching a maximum at about 8:30 am. By 9:30 pm. th signal decreased significantly probably indicating the loss of pollution by wind currents and thermal convection currents.

**40665 APTIC NO. 63384**

Robinson, J. W. and D. K. Wolcott

SIMULTANEOUS DETERMINATION OF PARTICULATE AND MOLECULAR LEAD IN THE ATMOSPHERE. *Environ. Letters, 6(4):321-333, 1974. 13 refs.*

A method using flameless atomic absorption is described for the simultaneous determination of particulate and molecular lead. Particulates are filtered out onto a suitable medium during the collection of samples, and molecular lead from the filtered air stream is collected by adsorption on a bed of carbon for subsequent heating with a radio frequency coil. The lead is atomized and determined directly. Results obtained near a large car park are presented and indicate that a large proportion of the lead measured is molecular. The diurnal maxima correspond to peak traffic periods.

**40666 APTIC NO. 63241**

Rykhter, E. V.

DYNAMIC STUDY OF GASEOUS AND PARTICULATE POLLUTION IN WORKPLACES AND IN THE ATMOSPHERE. *(Dinamicheskiye issledovaniya gazovogo i pylevogo zagryazneniya vozdukha proizvodstvennyk pomescheniy i atmosfery). Text in Russian. Vodosnabzh. i Sanit., no. 1:26-28, 1974. 2 refs.*

The uses and advantages of the dynamic method, using liquid medium for the absorption of gaseous and particulate pollutants, in the characterization of the evolution of air pollutant concentrations in workplaces and in industrialized urban areas are presented. The dynamic method, determining the air pollutant concentrations at short intervals and as a function of meteorological factors such as wind direction and speed, is suitable for the determination of the concentration variations, the effect of technological improvements, and the efficiency of air pollution control measures taken. Actual measurements of sulfur dioxide, chlorine, and dust concentrations in industrialized urban areas revealed considerable concentration variations from minute to minute.

**40667 APTIC NO. 64783**

Sakata, Mamoru

PROBLEMS IN MEASUREMENT OF NOX AND HYDROCARBONS. *(NOx, tanka suiso sokutei jo no mondaiten). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 3(7):490-499, July 1974. 8 refs.*

The spectrophotometric method, which uses liquid absorption for nitrogen oxide sampling, usually gives varied collecting efficiency at different gas-liquid contact ratios. Therefore, the efficiency varies with gas flow rate, pipe diameter and the shape of container. The Saltzman method, which utilizes N-(1-naphthyl)ethylenediamine as reagent for the formation an azo dye for absorption measurement may have a standard error of 12% at a full scale. The chemiluminescence method for NOx analysis has been proposed as a standard method. This dry method has the advantages of high sensivity, quick response, and linearity of response. It has been applied in the detection of nitrogen dioxide in stacks. Utilization in environmental studies entails problems that remain to be solved. At high temperature, which is required for the conversion of NO2 to nitric oxide, ammonia in air is also converted to NO. At low temperature, the conversion of NO2 to NO is greatly reduced. Flame ionization detector (FID) is suitable for the analysis of hydrocarbons. It has the advantages of high sensitivity, little interference, linearity in response, and simple structure. However, safety measures for high pressure gas are required with this method. A common problem in the analysis of NOx and HC is the dependability of standard gas.

**40668 APTIC NO. 63234**

Schreinicke, G. and H. Schaffernicht

TELEMETRIC TRANSMISSION OF CONCENTRATIONS OF HARMFUL SUBSTANCES IN THE BREATHING ZONE DETERMINED IN HUMANS. *(Telemetrische Uebertragung von personenpersonengebunden ermittelten Schadstoffkonzentrationen in der Atemzone). Text in German. Z. Ges. Hyg., Ihre Grenzgebiete (Berlin), 20(4):201-204, 1974. 12 refs.*

An electrochemical method is described which, using a gas sampler described by Schaffernicht, permits a continuous measurement of pollutants in the breathing zone. The air sample is drawn through a chamber filled with an electrolyte. With unpolluted air a current of 30 microamperes flows between the measuring electrodes. In the presence of substances reacting with the products from electrolysis the current drops and a generator current liberates fresh reagent in the measurement chamber. The magnitude of the generator current is proportional to the pollutant concentration. The equipment is described and circuit diagrams are presented. The method was tested with the pollutant sulfur dioxide (SO2). There is a linear relationship between the telemetrically transmitted signal and the pollutant concentration up to a range of ten times the permissible maximum SO2 working place concentration.

**40669** **APTIC NO. 64935**

Sekigawa, Kimishige, Hiroshi Kojima, and Toshio Sekigawa

THE WHITBY PARTICLE ANALYZER - FORMATION OF UNIPOLAR IONS. *(Whitby hoshiki ni yoru ryushi saizu anaraiza ni tsuite---yuni pora na ion gassei). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 10:29-33, Feb. 1974. 2 refs.*

The electrical particle counter developed by Whitby was examined for characteristics and measurement conditions. The system consists of an aerosol charger and mobility analyzer. The particle size is determined by measuring mobility and the particle number is obtained from the quantity of current passed. The ion generator was built and tested. The performance was evaluated by varying the following factors: S, distance between electrode; P, comprssed air pressure, V, potential of the metallic needle electrode with the plate electrode earthed; d, diameter of hole made on the plate electrode. The value S equals 1.5-2.0 mm was most suitable, giving a satisfactory quantity of ion generation and stability. The ion concentration varied little with air pressure, however, 2.0 kg/sq cm was most suitable, since the stability deteriorated at lower pressures. Lower pressure was more suitable for prolonged use. The relationship betwee ion concentration and V was investigated by varying d. Since the d is closely related to air flow rate, the air flow rate should be determined first and then d and necessary ion concentration. The quantity of ion generation decreased rapidly in the initial 20 min, and then stabilized fairly well until it reached about 1/2 of the value registered at 30 min, after 24 hr.

**40670** **APTIC NO. 64618**

Sheraton, Ronald Frederick

SMOKE SAMPLING MACHINE. *(C.A.V. Ltd., Birmingham (England)) Brit. Pat. 1,343,439. 5p., Jan. 9, 1974. (Appl. June 14, 1971, 10 claims).*

A smoke sampling machine is described in which a sample comprising a predetermined volume of smoke laden gas is passed through a filter paper, the filter paper acting to retain the particles of soot or the like suspended in the sample of smoke laden gas and means for measuring the discoloration of the filter paper thereby to provide an indication of the quantity of soot or the like contained in the sample. The machine is of particular use for testing the amount of smoke contained in the exhaust gases of an internal combustion engine. The invention is simple and convenient, and is more accurate than the prior machines.

**40671** **APTIC NO. 63156**

Sloot, H. A. van der and H. A. Das

DETERMINATION OF MERCURY IN AIR BY NEUTRON ACTIVATION ANALYSIS. *Anal. Chim. Acta, 70(2):439-442, 1974. 6 refs.*

A neutron activation analysis method is described for determining organic and inorganic mercury in the air. Mercury was absorbed by activated carbon, separated by the radioactive matrix by evaporation, and absorbed on a second carbon absorbent. Concentrations down to 0.5 ng Hg/cu m could be determined. The equipment, reagents, purification of activated charcoal, sampling irradiation, separation of mercury, and results are described. Samples of laboratory air, atmospheric air, natural gas, and offgas from the mud fermentation reservoir of a sewage plant were used to test the analytical method.

**40672** **APTIC NO. 63075**

Spang[illegible] Glenn E.

MEMBRANE TECHNOLOGY IN TRACE GAS TECHNOLOGY. *Preprint, 21p., 1974. 1 ref. (Presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, 25th, Cleveland, Ohio, March 8, 1974.)*

Design features, operating characteristics, and test results are given for a Universal Monitor Olfax instrument which detects trace gases from explosives. The instrument includes a dual stage membrane inlet system and a quadrupole mass spectrometer. The membrane inlet system consists of two 0.75 mil dimethyl silicone membranes separated by an interstitial volume pumped independently through a variable conduction limiting orifice. Mass spectra are illustrated for trinitrotoluene and one of the impurities normally found in it. The partial pressure drop of TNT vapor across the membrane inlet system of the Olfax instrument is greater than 10,000 mm mercury; and, with a gain of 10,000 on the electron multiplier and minimum detectable signal level of 1.0 times 10 to the minus 11 amp, the sensitivity of the instrument to TNT vapor is 1 part in 10 to the 10 at mass 89 and 1 part in 10 to the 9 at mass 210.

**40673** **APTIC NO. 63270**

Stedman, Donald H. and Philip A. Meyers

INSTRUMENTAL ANALYSIS IN ENVIRONMENTAL CHEMISTRY--LIQUID AND SOLID PHASE DETECTION SYSTEMS. *BioScience, 24(6):346-349, June 1974. 47 refs.*

Liquid and solid phase detection systems for instrumental analysis in environmental chemistry are described. They include: liquid chromatography, infrared analysis, ultraviolet and visible absorption, electron spin resonance, nuclear magnetic resonance, electroanalytical techniques as polarography, neutron activation analysis, and X-ray fluorescence. A general description of each method is presented and selected references are made to allow for individual application of the methods. Electrochemical techniques for gaseous air pollutants are available for oxidant, nitrogen dioxide, sulfur dioxide, carbon monoxide, and several other gases, with minimum detection limits in ppm of Ox, 0.01; NO2, 0.05; SO2, 0.05; and CO, 0.04. Both neutron activation and X-ray fluorescence are used in air pollution studies of collected aerosols.

**40674** **APTIC NO. 64944**

Stockmeyer, Rudolf

INVESTIGATIONS USING A KONITEST DUST MEASURING DEVICE IN WASTE GASES OF PLANTS OF THE STEEL INDUSTRY. *(Untersuchungen mit einem Konitest -Staubmessgeraet in Abgasen von Anlagen der Stahlindustrie). Text in German. Arch. Eisenhuettenw., 45(6):389-394, June 1974. 16 refs.*

An improved Konitest dust measuring device with a venturi-type exciter tube and the dust concentration measurements achieved by this device in metallurgical plant-generated emissions are described. The leakage current, of extremely small value, as generated by the contact-electric interaction of impacting and rebounding particles and the inner surface of the venturi exciter tube, is a measure of the dust content in the turbulent gas flow. The modified Konitest device is especially suitable for the dust content measurement in brown smoke which tends to settle in the conventional device. The gas flow should be admitted to the exciter tube immediately from the flue duct to prevent possible contact-electric changes in charge prior to entry. Best results were achieved by the use of a steatite (magnesium hydrosilicate) coating on the exciter tube. Continuous measurement of the dust emission under different operating conditions of open-hearth furnaces and top-blown oxygen converters was performed.

**40675** **APTIC NO. 63253**

Tamori, Ikuo

STACK DUST SAMPLER FOR ISOKINETIC SAMPLING. *(Sutakku dasuto Sanpura--tosoku kyuinkan o chushin ni). Text in Japanese. Funtai Kogaku Kenkyu Kaishi (J. Res. Assoc. Powder Technol., Japan), 11(3):154-158, May 1974. 10 refs.*

Flue gases have many different characteristics depending on the emission sources. Some of the presently used measuring methods, dust samplers in particular, are not applicable for various reasons. The temperature is one limiting factor. Cellulose filters can take gases only below 150 C. Glass fiber filters can be used only at less than 500 C. Silica filters can be used up to 1000 C. The previously used dust tubes with silica wool packing were too expensive; but the silica fiber dust tube filter paper costs only 20% as much as the glass fiber filter paper. In order to prevent loss of weight by heat, silica fiber filter papers must be prebaked at 800 C for one hour and dried at 105- 110 C before using. The water content in gas is usually about 10% and is no problem. But water saturated scrubber treated gas ruins any filter paper. The solution is packing the tube with only half the amount of glass wool and packing the rest with a drain-catcher. Sulfur dioxide in the gas creates the problem of adsorption and increasing the amount of dusts to be measured. The use of silica fiber filter paper, which adsorbs only negligible amounts of SO2, is recommended for sampling of SO2 containing gases. The problem of sampling gases with fluctuating flow speed can be solved with a probe with an isokinetic suction tube designed by the Agency of Scientific Industrial Technology. The principle, structure and efficiency of this apparatus are discussed with diagrams and graphs.

**40676** **APTIC NO. 63164**

Tesarik, K. and M. Krejci

CHROMATOGRAPHIC DETERMINATION OF CARBON MONOXIDE BELOW THE 1 PPM LEVEL. *J. Chromatog., vol. 91:539-544, April 1974. 24 refs.*

A chromatographic method is described for the determination of carbon monoxide at concentrations below 1 ppm. It is based on the utilization of increased sensitivity of chromatographic methods, which was achieved by decreasing the retention volume of the analyzed component and by using selective, highly sensitive detection. The elution of CO in the dead volume was achieved by using a combination of activated charcoal and a porous polymer. A system for the selective detection of CO based on its conversion into methane and on the use of a flame ionization detector was developed. A constant flow rate of nitrogen and hydrogen through the burner must be maintained and the entry of primary oxygen into the flame must be avoided. The setting of the instrument permits relatively large samples (20-50 ml) of gases to be introduced without substantially affecting the efficiency of the chromatographic separation, and provides the possibility for the separation of interfering components (oxygen and nitrogen) before the chromatographic column.

**40677** **APTIC NO. 64912**

Thomas, Josephus, Jr. and Harold J. Gluskoter

DETERMINATION OF FLUORIDE IN COAL WITH THE FLUORIDE ION-SELECTIVE ELECTRODE. *Anal. Chem., 46(9):1321-1323, Aug. 1974. 10 refs.*

A fluoride ion-selective electrode method is described for the determination of F in coal. Coal samples are decomposed in a combustion bomb, the pH of the bomb contents is adjusted, and the solution is buffered prior to the determination of the fluoride concentration with the F ion-selective electrode. Analysis is by the addition method in which the change of potential resulting from the addition of a known volume of standard F solution to the initial test solution is used to determine the fluoride concentration of the initial solution. The technique is superior to direct potentiometry as problems resulting from interferences, complexation, and ionic strength variations are virtually eliminated. Analytical data are presented for coal samples decomposed by the bomb combustion method and by alkali fusion as well as for fluoride determinations of coal samples with test solutions at different pH values.

**40678** **APTIC NO. 64479**

Tsuruta, Wataru

MAINTENANCE AND ACCURACY CHECK FOR CHEMILUMINESCENCE NOX METERS. *(Kagaku hakkoshiki NOx-kei no seido iji to mentenansu ni tsuite). Text in Japanese. Keiryo Kanri Keisoku Keiso (J. Instrum. Control Assoc., Japan), 23(5):9-11, 1974.*

One important part of the chemiluminescence NOx meter is the flue gas leader and pretreatment system. The first filter is usually heated to prevent condensation of water, but when the dust and water content is high in the flue gas, the filter is often clogged or the probe is corroded. If the heater line is broken, nitrogen dioxide is completely absorbed by water and the measurement of NOx becomes virtually impossible. The life of the filter element depends on the flue gas conditions. The filter should be checked carefully in the initial stage, and when the test gas flow quantity begins to change, the filter should be exchanged. Other important points requiring special inspection are the gas leader line, cooler, sampling pump, secondary filter, analyzer, detector, ozonizer, reaction tank, amplifier, and power source. The only coexisting gas that will interfere with the measurement of nitric oxide is carbon dioxide. Regardless of the NO concentration, the measurement will be lowered by an amount proportional to the concentration of CO2. Generally, when CO2 is 10-15%, the figures will be lower by 3 to 5 ppm NO per 100 ppm than actual measurements. The data must be adjusted accordingly. The equipment has to be calibrated by standard gas. Zero point (by nitrogen gas) and span (by a reliable standard NO gas) must be adjusted simultaneously. By passing these gases for 5 min, the noise, response time, and drifts can be checked.

**40679** **APTIC NO. 64730**

Tsutsui, Seiji

RETENTION OF ACCURACY AND MAINTENENCE OF THE IODIMETRIC SULFUR DIOXIDE COUNTER. *(Yoso denkyoku ho ni youru SO2 kei no seido iji to mentenansu). Text in Japanese. Keiryo Kanri Keisoku Keiso (J. Instrum. Control Assoc., Japan), 23(4):17-19, 1974.*

The iodimetric sulfur dioxide counter is characterized by high accuracy, measurement of moment variation in SO2 concentration, and integrated concentrations. The SO2 gas is absorbed in a solution containing iodine and the iodine ion produced is measured. The accuracy of this instrument is governed most of all by the sensitivity of the iodine ion electrode which is generally affected by the presence of interfering ions. By the dissociation of I2 in absorption solution, a small amount of I ion is produced, which can be controlled by adding acidic buffer solution containing acetic acid, thus, increasing H(+) concentration. The concentration of the I(-) produced is determined as a function of SO2 gas concentration (ppm), flow rate of sample air (Ml/m), and flow rate of absorption solution (ml/m). Therefore, the accuracy of flow rates directly determines the accuracy of the instrument. The sensitivity of the electrode is affected by the foreign substance adhered to the calcined film surface of the electrode, sunlight (ultraviolet), and temperature. Adjustment by the static method which primarily checks out the detector system should be done once a week. Adjustment by the dynamic method, which checks the flow rate of the Quantitative pump, reaction efficiency of SO2 gas and absorption solution, and response sensitivity to the variation in SO2 concentration should be done once a month under normal operating conditions.

**40680** **APTIC NO. 63400**

*Uemura, Teiji*

*A PILOT MODEL FOR BETA-RAY DUST METER. (B-sen baijinkei no shisaku). Text in Japanese. Preprint, Osaka Prefectural Industrial Research Inst., p. 31-32, 1974. (Presented at the Osaka Prefectural Industrial Research Institute, 1974 Study Meeting, Osaka, Japan, May 29, 1974, Paper I-16.)*

A method for measuring the area weight or concentration of dusts in the air current has been devised using radiation absorption (63 Ni beta ray). The method was further improved and a pilot model apparatus was constructed. The dust quantity is measured by collecting dusts on a filter paper and by measuring the decrease in the filter permeation of the beta ray. A glass fiber filter of 7 mg/sq cm is more resistant to high temperature gases than a cellulose filter paper, less hygroscopic, and more efficient; it is easily damaged, however, and a frame holder is necessary. The pressure formed at 50 G ohm, resistance (Ri) is amplified by a low bias current OP amplifier, and the output pressure is read. Before capturing the dusts, the electric pressure output of B-rays (permeation rate) of the filter paper is recorded. The filter is installed between dust collection tubes heated to an appropriate temperature, and gas is drawn at a given and even speed. The filter paper is then cooled and the electric pressure is measured. The difference before and after collection is measured. The apparatus is simple and relatively accurate. It is applicable for automatic measurement at high concentration levels. Automation of even speed suction will be necessary.

**40681** **APTIC NO. 64659**

Vostrikov, V. I., R. S. Podrezenko, L. A. Vasil eva, I. A. Osin, and M. I. Bukovskiy

LINEAR COLORIMETRIC METHOD FOR THE DETERMINATION OF BUTYL ALCOHOL IN THE AIR. *(Lineyno-koloristicheskiy metod opredeleniya butilovogo spirta v vozdukhe). Text in Russian. Zavodsk. Lab. (Moscow), 4(40):383-384, 1974.*

An improved method for the linear colorimetric determination of butyl alcohol concentrations in the air by a highly sensitive reagent is described. The reagent solution is prepared by dissolving chromic anhydride in sulfuric acid, after which a 0.7:0.3 mixture of kaolin with a specific surface of 30-70 sq m/g and glass with a specific surface of 0.1-0.4 sq m/g (both being in a grain size range of 0.16-0.25 mm) is wetted with that solution, and the colorimetric reagent is dried at 120-130 C until a pink color develops. The reagent is placed in glass indicator tubes through which 800 ml air is drawn for 10 min. The amount of the tube in which the color shifts from pink to blue is a measure of the butyl alcohol concentration in the air. The sensitivity of the colorimetric method amounts to 2.5 mg/cu m at an error of + or - 10.12%.

**40682** **APTIC NO. 60892**

Wahl, John P., Richard A. Duffee, and William A. Marrone

EVALUATION OF ODOR MEASUREMENT TECHNIQUES: VOLUME I. ANIMAL RENDERING INDUSTRY. (INTERIM FINAL). *TRC-The Research Corp. of New England, Wethersfield, Conn., Environmental Protection Agency Contract 68-02-0662, Program Element 1A1010, EPA-650/2-74- 008-a, 93p., Jan. 1974. 8 refs.*

NTIS: PB 228186/AS

The performance requirements for odor emission measurements for rendering plant process emissions, based on a dilution-to- threshold ratio technique, were studied. An in-situ dynamic dilution system, referred to as the ISDD technique, was used as the reference or referee method. The odorous emissions were continuously vented directly from the sample point to an eight- member olfactory panel by means of a dynamic dilution system installed in an on-site mobile odor laboratory. An identical system was used for off-site dynamic dilution measurements (the OSDD method). The EPA modification of the ASTM syringe dilution technique was also evaluated. This is the off-site static dilution (OSSD) method. The OSSD and ISDD results were compared, and causes of variations of the various methods were determined. Field tests were carried out at a rendering plant where emissions are vented into a two-stage scrubbing system before release to the atmosphere. Total air flow through the scrubber was 100,000 standard cu ft/min. Samples were collected at the scrubber outlet, scrubber inlet, and in the cooker noncondensible line to provide a wide range of odor levels for testing the applicability of the various dilution techniques and sampling methods. The effects of sampling factors, such as pre-conditioning of containers, container materials, storage time (aging) of samples, surface-to-volume ratio of containers, and humidity of emitted gases on the validity of odor measurements were evaluated. The effects of panel selection and training procedures, the number of panelists and dilution method, and calculation procedures on the accuracy and reproducibility of rendering process odor measurements were determined. Correlations between chemical measurements of rendering process emissions and dynamic odor unit levels were also developed. (Author abstract modified)

**40683** **APTIC NO. 63283**

Wang, C. P.

APPLICATION OF LASERS IN ATMOSPHERIC PROBING. *Acta Astronaut., 1(1-2):105-123, Jan.-Feb. 1974. 77 refs.*

The direct measurement of atmospheric parameters by laser technique was surveyed. Light interactions (including Mie, Rayleigh, resonance-fluorescence, Raman scattering, and light absorption) were used for the laser probing of atmospheric constituents, temperature profiles, and aerosol distributions. The laser probing technique measures vertical profiles of the three primary meteorological parameters (wind, temperature, and humidity) and has the potential of measuring the temporal and spatial variation of the spectrum of these variables. The equipment is portable and airborne and even satellite based installations allow wide range coverage. (Author conclusions modified)

**40684** **APTIC NO. 64676**

Winkler, Peter

RELATIVE HUMIDITY AND THE ADHESION OF ATMOSPHERIC PARTICLES TO THE PLATES OF IMPACTORS. *J. Aerosol Sci., 5(3):235-240, 1974. 10 refs*

Quantitative proof of the increased retention efficiency of humidified atmospheric aerosol particles is obtained in two series of experiments using impactors to collect thy particles and a microbalance to determine the water free dry mass of aerosol collected. Results show that atmospheric aerosol particles can be collected by means of impactors with sufficiently high retention efficiency even without any viscous substrate on the collection plate if the relative humidity remains high enough (greater than 75%) during the sampling period. The absorbed water of the particles acts as an adhesive. This effect is further supported by the moisture of the particles already deposited which act like a viscous coating of the collection plate. With decreasing humidity (less than 75%) the retention efficiency of the collection plate decreases rapidly. At low r.h. (less than 75%) a change in the relative composition of the sample can occur due to a preferential deposition of the water soluble material. This can only happen if there are differences between the average composition of the total aerosol mass as indicated by the analysis of the bulk sample and the composition of the individual aerosol particles. Additional information would be desirable on the radius dependence of retention efficiency and more measurements would result in better statistics. A direct comparison of the humidity-dependent mass retention efficiency with the mass retention efficiency achieved by viscous media, would be of interest.

**40685** **APTIC NO. 63374**

Wolf, Philip C.

SYSTEMS FOR CONTINUOUS STACK-GAS MONITORING. PART 3: SYSTEMS DESIGN. *Mech. Eng., 96(6): 29-33, June 1974. 7 refs.*

Continuous systems for stack gas monitoring should be automated as much as possible. The sampling system is a very important part of the total monitoring system. The sampling location should be selected to provide representative concentrations. The sampling line from probe to analyzer should be as short as possible to ensure minimum response time. An example of a total automatic monitoring system for sulfur dioxide is discussed. A heated pipe conveys the sample gas from the probe to the condenser, where the water vapor level is brought to a dewpoint consistent with 34 F; then the gas passes through a three-way solenoid valve that allows introdution of calibration gases; the gas then is fed through a membrane filter to the pump, then passes the flowmeter to the analyzer, and then is emitted to the atmosphere. When this system was tested at a boiler, performance was excellent. Recording of sulfur dioxide before and after the use of an SO2 removal system are presented. In the past, stack gas analysis has been poor due to failures from improper engineering and lack of careful planning and design of the system; the technology available today allows measurement in the most complicated stack monitoring cases, provided good engineering practice is followed.

**40686** **APTIC NO. 63170**

Yakovleva, N. A. and M. Y. Son Kin

JOINT DETERMINATION OF METHACRYLIC ACID AND FORMALDEHYDE IN THE AIR. *(Opredeleniye metakrilovoy kisloty i formal degida v vozdukhe pri ikh sovmestnom prisutstvii). Text in Russian. Gigiena i Sanit., no. 4:60-62, 1974. 2 refs.*

A colorimetric method with graphic evaluation for the determination of methacrylic acid and formaldehyde simultaneously present in the air is described. Air is sampled through 2% solution of ammonium acetate at a rate of 0.4 l/min. Part of the sample solution is treated with a mixture of potassium permanganate with potassium periodate for the oxidation of methacrylic acid to formaldehyde at the double bond, after which both samples are treated in the same manner with chromotropic acid to achieve color reaction of formaldehyde. The optic density of the test solution is determined by colorimeter, and the result is graphically calculated by a calibration curve.

**40687** **APTIC NO. 64772**

Yarunicheva, N. A. and S. F. Yavorovskaya

COMPARATIVE EVALUATION OF SORBENTS FOR GAS-CHROMATOGRAPHIC DETERMINATION OF CARBON MONOXIDE. *(Sravnitel naya otsenka sorbentov dlya gazokhromatograficheskogo opredeleniya okisi ugleroda). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 6:58-63, 1974. 9 refs.*

The suitability of various sorbents, such as the molecular sieves CaA-5A, NaX-13x, 13x, silochrome-3, polysorb-1, and graphitized carbon black, for the absorption of carbon monoxide from a mixture with carbon dioxide, methane, ethane and propane for subsequent gas-chromatographic determination was studied. The molecular sieve CaA-5A, irreversibly absorbing CO2, ethane, and propane, was best for the gas chromatographic determination of CO.

**40688** **APTIC NO. 64652**

(Inventor not given.)

IMPROVEMENTS IN OR RELATING TO SAMPLING OF AIR-BORNE PARTICLES. *(2000 Inc., Salt Lake City, Utah) Brit. Pat. 1,354,261. 6p., May 22, 1974. (Appl. April 19, 1971, 10 claims).*

A device and a method for collecting dust and smoke particles of micron dimensions suspended in the air or other gases to determine the degree of contamination are described. The particles are deposited according to their size, shape, and density as they are collected on surfaces of plates. The plates can be readily inspected and analyzed for complete assessment of health hazard. The device can be used in a chemical smoke stack. It is small and light and can be attached to the clothing of a worker to obtain a true measure of his exposure to air contamination.

**40689** **APTIC NO. 64745**

Yokohama Municipal Government (Japan)

AIR POLLUTION MONITORING SYSTEM. *(Taiki os[illegible] kanshi shisutemu). Text in Japanese. 8p., 1974.*

The air pollution monitoring system of Yokohama is presented with diagrams and photographic illustrations. The entire monitoring system was designed and constructed in steps between 1965 and 1972. The system now constitutes 12 continuous monitoring stations for sulfur oxides, nitric oxide, nitrogen dioxide, oxidants, suspended particulates, wind direction, and wind velocity, 8 continuous monitoring stations for automotive emission (carbon monoxide, NO, NO2, suspended particulates, oxidants, total hydrocarbons, traffic amount, and traffic tie-up), and 2 weather monitoring stations for wind direction, wind velocity, and temperature. These measurements are transmitted by telemetry to the central control board and further transmitted to the prefectural air pollution control center, to the panel indicator, to television monitors, and to line printers. In addition, 21 monitoring stations were constructed in 1973 on industrial sites for the monitoring of industrial emission sources, and 20 more are scheduled for 1974.

## 1973

**40690** **APTIC NO. 64651**

Allen, J. D.

A REVIEW OF METHODS OF ANALYSIS FOR OXIDES OF NITROGEN. *J. Inst. Fuel, 46(384):123-133, March 1973. 176 refs.*

A review of numerous methods for the analysis of oxides of nitrogen (nitric oxide and nitrogen dioxide) is presented. The methods considered range from the widely used wet chemical techniques to commercial instruments providing continuous monitoring and include: infra-red spectroscopy, chemiluminescence detectors, ultraviolet spectroscopy, mass spectrometry, and gas chromatography. The range of concentrations considered is from 0.01-5000 vpm. The Griess-Saltzman reagents appear to offer the fastest and most convenient method of analysis among the wet chemical methods and are the least subject to interference, although calibration of each reagent preparation with standard nitrogen dioxide mixtures appears desirable for the highest accuracy. Various electrochemical devices appear to satisfy requirements of portability for on site measurements but may be subject to interferences when used for combustion product analysis. No satisfactory gas chromatographic method has been developed for vpm levels of oxides of nitrogen in combustion products. The chemiluminescence monitor offers the greatest promise as an instrumental method for laboratory and possibly on-site measurements, owing to its high sensitivity, specificity, and reliability.

**40691** **APTIC NO. 64728**

Byers, R. L.

EVALUATION OF EFFLUENT GAS PARTICULATE COLLECTION AND SIZING METHODS. *Proc. Am. Petrol. Inst., Div. Refining, vol. 53:60-72, 1973. 2 refs.*

In order to properly design and evaluate particulate control devices, to predict visible emissions from stacks, and to continuously monitor particulate emissions, it is becoming increasingly important to obtain accurate size distribution information for refinery effluent streams. In general, no standardized methods of particulate collection and analysis have been adopted by environmental agencies or industry. Therefore, several particle sampling and analysis techniques for obtaining reliable particle size measurements were evaluated. Particle samples were taken from a slipstream of process flue gas. They were collected by a membrane filter, glass fiber filter, wet impinger, and Andersen in-stack sampler. Size analyses were obtained by light and scanning electron microscopy of filter samples; size distributions from the Andersen sampler were calculated using both the Ranz and Wong equation and the manufacturer s calibration curves. Particles were collected in a virtually unagglomerated form on membrane filters. The Andersen sampler, when used with standard collection plates, tended to give a finer size distribution than actually exists due to re-entrainment effects. Coating of the plates with a 1% solution of silicone grease in benzene produced size results reasonably comparable to those obtained by microscopy. When the gas temperature is below 300 F or can be cooled below this temperature, samples should be obtained on membrane filters and particle size analysis should be done microscopically. Above 300 F, reasonable results can be obtained from the Andersen sampler, provided the collection plates have been coated. More data are needed to establish a definite relationship between Andersen and microscopic analysis. Use of sampling techniques which cause agglomeration, such as glass fiber filters, wet collection, bulk grab samples, and scrapping of deposits from surfaces, should be avoided. (Author summary modified)

**40692** **APTIC NO. 64800**

Carcassoni, B., M. Ravasio, and F. Zilio-Grandi

OBSERVATIONS ON THE DETERMINATIONS OF SO2, SO3, SULPHURIC ACID AND AMMONIUM SULPHATE IN THE ATMOSPHERE. *(Osservazioni sulla determinazione di anidride solforosa, anidride solforica e acido solforico, ammoniaca e solfato ammonico in aria). Text in Italian. Med. Lavoro (Milan), 64(1-2):41-50, 1973. 12 refs.*

To evaluate the hygienic conditions of a work area where sulfur dioxide, sulfur trioxide, sulfuric acid, and ammonium sulfate are present in the air, several techniques of collection and analysis were studied. Sulfur dioxide and total sulfates can be collected on absorbents with potassium tetrachloromercurate. Colorimetric determinations can be made for SO2 and nephelometric determinations can be made for sulfates. The SO2 can be measured less exactly by a continuous analyzer or can be calculated as a difference between the total sulfate value by nephelometric determination after oxidation and the value of the sulfate obtained by concentraton obtained on a micropore membrane (diameter 50 mm, pore diameter 0.2 micron, capacity 20 l/min). Sulfuric acid, sulfates, and ammonium (aerosol) can be determined by concentration on a micropore membrane; after dissolving the sediment, determination by pH measurement of free H2SO4, nephelometric determination of sulfate, and colorimetric measurement of ammonium follow. Ammonia can be collected on absorbents with 0.01 N H2SO4 and determined by colorimetry.

**40693** **APTIC NO. 62912**

Cross, Robert A. and Stuart C. F. Robinson

SOME APPLICATIONS OF RAPID GAS CHROMATOGRAPHY. *J. Appl. Chem. Biotechnol., vol. 23:115-118, 1973. 3 refs.*

A gas chromatograph was developed to analyze simple gas mixtures rapidly, repetitive separations being possible every few seconds. The instrument operates automatically, sampling from a number of points, and it can be remotely controlled. Changes taking place in the composition of atmospheres, flue gases, and engine exhausts, which were too rapid for estimation by conventional sampling and analytical procedures, were followed without difficulty. The results of these analyses were presented and discussed. The chromatograph was applied to a study of the failure of a gas-fired appliance to ignite. The natural gas content was measured. The chromatograph was also used to measure methane and carbon dioxide in engine exhaust gas to determine engine malfunction in an engine using two fuels (natural gas with oil as alternative for stand-by fuel). The accumulation of natural gas in an enclosure was also measured by the chromatograph. (Author abstract modified)

**40694** **APTIC NO. 64702**

Fedynskiy, A. V. and V. A. Yushkov

TOWARD A THEORY OF MEASUREMENT OF A MINOR IMPURITY IN THE ATMOSPHERE WITH A SORPTION-TYPE SENSOR. *Bull. Acad. Sci. (USSR), Phys. Atmos. Oceans (English translation from Russian of: Izv. Akad. Nauk SSSR, Fiz Atmosfery i Okeana), 9(11):640-643, Nov. 1973. 6 refs.*

Certain aspects of mass exchange are considered for a sorption- type sensor used in measurements of a minor impurity in a subsonic (M less than or equal to 0.3) continuum gas flow. The results can be used in rocket, aircraft, and balloon experiments. The theory is presented regarding cases of a flat sensor of the sorption type placed along the incident gas flow, of a cylindrical sensor in flow parallel to the cylinder axis, of a flat sensor placed perpendicular to incident gas flow, and of a cylindrical sensor in a gas flow perpendicular to its axis. (Author abstract modified)

**40695** **APTIC NO. 63071**

Girton, R. C., L. T. Lakey, and D. T. Pence

THE STACK MONITOR SYSTEM AT THE IDAHO CHEMICAL PROCESSING PLANT. *Allied Chemical Corp., Idaho Falls, Idaho, National Reactor Testing Station, Atomic Energy Commission Contract AT(10-1)-1375 S-72-1, Rept. ICP-1034, 36p., Sept. 1973. 8 refs.*

NTIS: UC-70

A stack monitor at the Idaho Chemical Processing Plant was evaluated for its performance in measuring the release rate for radionuclides carried as particulates in the gaseous effluents emitted from the plant ventilation and process off-gas systems. The evaluation studies demonstrated that the stack monitor is collecting a representative sample of the particulates up to 20 micron in diameter in the sample line. Loss of particulates due to plateout was not significant. Either HV-70 or fiber glass filters were found equally suitable, although both lacked chemical solubility. Analytical accuracy for certain radionuclides could be increased as much as 50% if the filter were soluble.

**40696** **APTIC NO. 64584**

Guidoboni, Richard J.

DETERMINATION OF TRACE ELEMENTS IN COAL AND COAL ASH BY SPARK SOURCE MASS SPECTROMETRY. *Anal. Chem., 45(7):1275-1277, June 1973. 5 refs.*

A spark source mass spectrometric method for the analysis of trace amounts of manganese, nickel, chromium, vanadium, copper, and zinc in coal and coal ash samples is described. The coal samples are dry ashed, and a comparison of wet ashing and dry ashing of some of the elements determined in the study shows good agreement between the two sets of data, indicating that none of the above elements are lost during the dry ashing. A comparison of spark source mass spectrometric and atomic absorption spectrometric (secondary standard) data for 10 different coal samples from various geographical areas shows very good agreement. Hydrocarbon interference is not a problem. Lack of a dissolution step in the sample preparation and very high sensitivity are the method s advantages.

**40697** **APTIC NO. 64910**

Hayashi, Hisato

QUANTITATIVE DETERMINATION OF AIRBORNE ASBESTOS DUST IN OCCUPATIONAL ENVIRON-

MENT BY X-RAY DIFFRACTION USING CONVENTIONAL AND ROTATING ANODE X-RAY TUBE. *Ind. Health (Japan)), 11(4): 225-236, Dec. 1973. 17 refs.*

The application of X-ray diffraction techniques, using both conventional and rotating anode X-ray tubes, is described for the determination of airborne asbestos dust in occupational environments. Airborne asbestos is collected on a glass fiber filter by means of a high volume air sampler and can be analyzed without removal of the dust from the filter and without addition of an internal standard material. Total dust is determined by weighing of the filter before and after sample collection, and mass per unit volume of air is estimated by recording the total volume of air that passes through the filter. Conventional X-ray diffraction, using a sealed anode X-ray tube, is applicable for determining 1-5 mg of asbestos. Diffraction analysis by use of a rotating X-ray tube which generates higher power X-rays can be routinely conducted in the laboratory or occupational environment when the total sample is of the order of 0.01 mg for a glass fiber filter of 3.9 sq cm in area. Analytical data from field trials are presented for asbestos and total dust in the asbestos textile industry.

**40698** **APTIC NO. 63287**

Kachi, Hironari, Nobuhiko Nakano, Kazuo Kimura, Tadashi Ito, Tatsuo Kato, and Hideo Ito

USE OF MODEL AIRPLANE FOR UPPER SAMPLING. *(Joku taiki no sanpuringu ni taisuru mokei hikoki no riyo). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):281, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 34.)*

As a sampling method for the upper sky atmosphere, a model airplane was used to avoid the manpower and expenses involved in the use of kitoons. A vacuum jar (1-liter capacity) was fixed on the plane and at a desired location, the glass capillary was broken by remote control. Using this device, air samplings of residential and industrial areas were taken at various altitudes. Part of the sampling was used for measuring carbon monoxide and methane, 5 ml was used for the analyses of organic chlorine compounds by gas chromatography, and the rest was used for analyzing organic compounds by FID gas chromatography. In the residential area of Kanagawa prefecture, a deep layer of consistent concentration of pollutants was found at a rather high altitude. Above the industrial area of Kawasaki, a variety of distribution patterns was detected.

**40699** **APTIC NO. 56556**

Kikuchi, Tadayoshi and Masaki Mori

ANALYTICAL AND MEASURING INSTRUMENTS FOR NITROGEN OXIDES. *(Chisso sankabutsu no bunseki, sokutei kiki). Text in Japanese. Kemikaru Enjiniaringu (Chem. Eng.), 18(1):69-72, Jan. 1973.*

Nitrogen oxides have generally been analyzed by continuous automatic photoelectric colorimetry using the Saltzman reagent. The analyzer simultaneously records 30 min or 1 hr average concentrations of nitric oxide and nitrogen dioxide. The air sample passes through a dust filter and a flowmeter; it then goes into a NO2 impinger with reacting liquid where the NO2 color is developed. Then the sample enters a NO oxidizer with a sulfuric acid/acidulated potassium permanganate solution where NO is converted to NO2. The solution enters an NO impinger with a reacting liquid of the same amount as in the NO2 impinger; the color of NO2 is developed. The color developments of NO2 and NO can be continuously measured by two independent photoelectric colorimeters because each impinger holds a color cell.

**40700** **APTIC NO. 63110**

Kretschmer, D. and J. Odgers

MODELLING OF COMBUSTORS: THE EFFECTS OF AMBIENT CONDITIONS UPON PERFORMANCE. *Preprint, American Society of Mechanical Engineers, New York, 11p., 1973. 23 refs. (Presented at the American Society of Mechanical Engineers. Gas Turbine Division Winter Annual Meeting, Detroit, Mich., Nov. 11-15, 1973, Paper 73-WA/GA-6.)*

A prediction technique was used to establish the changes in pollutant concentrations due to variations in ambient conditions. A simple, convenient, reaction rate is used for predictions and is linked empirically to a set of equations defining the carbon monoxide and hydrocarbon concentrations. Predictions of nitrogen oxides are based upon a relationship between the measured values of NOx in the exhaust and the theoretical maximum flame temperatures which can exist within the combustor. It is difficult to obtain very high combustion efficiencies (99.7%+) at idling conditions due to slow reaction rates and near- equilibrium conditions. If values of carbon monoxide, hydrocarbons, and NOx are specified, the method forecasts limiting values of equivalence ratio within the combustion zone. Varying ambient conditions can substantially alter the pollutant exhaust concentrations at the levels of efficiency specified. During a short time test, the most powerful variable operating upon efficiency is the change of air/fuel ratio occasioned by variations in the air and fuel flows. (Author abstract modified)

**40701** **APTIC NO. 64799**

Mascini, Marco and Arnaldo Liberti

AN AUTOMATIC POTENTIOMETRIC ANALYZER FOR FLUORIDE DETERMINATION IN STACK GASES. *Gaz. Chim. Ital., vol. 103:989-994, 1973. 4 refs.*

A potentiometric automatic analyzer for the determination of fluoride in stack gases is described. The sensing device is a galvanic cell with a fluoride ion specific membrane electrode and a calomel electrode. The gas bubbles into the absorbing solution, which is continuously renewed, and the potential of the cell is recorded. The analyzer can be used for the measurement of fluoride concentration in the range of 5-5000 micrograms/cu m. (Author summary)

**40702** **APTIC NO. 61187**

Nakano, Nobuhiko, Kousei Kachi, and Kazuo Kimura

MEASUREMENT OF ODOR AND DIESEL EMISSION ODOR. *(Akushu sokutei to diizesusha no haikishu). Text in Japanese. Jidosha Gijutsu (Automobile Eng.), 27(11):1246-1251, Nov. 1973. 9 refs.*

The representative odor measurement methods in use today are discussed. Among the odor measurement methods using olfactory sensation of a human panel are the American Society of Testing and Materials injection method, the three-point comparative smell bag method developed by the Tokyo Research Institute for Environmental Protection, and the Southwest Research Institute Method. The instrumental methods of odor analysis introduced include the low-temperature condensation gas chromatographic analysis, the I.I.T. Research Institute method, a gas chromatographic method specially designed for odor measurement of emission, and a few others. Odor constituents of diesel emission, aldehydes, polycylic aromatic, phenols, unsaturated paraffins, and sulfur compounds are discussed.

**40703** **APTIC NO. 62953**

Neti, Radhakrishna Murty and Raymond Ewalt Rocks

CONVERSION OF NITROGEN DIOXIDE TO NITRIC OXIDE. *(Verfahren zur Umwandlung von Stickstoffdioxyd zu Stickoxyd). Text in German. (Beckmann Instruments, Inc., Fullerton, Calif.) W. Ger. Pat. Appl. 2,231,459. 9p., Jan. 18, 1973. (Appl. June 27, 1972, 5 claims).*

A method for the conversion of nitrogen dioxide to nitric oxide for subsequent determination by ozone chemiluminescence reaction is described. Nitrogen dioxide as an air pollutant is converted to NO by UV irradiation in a wavelength range of 1849-6600 Angstrom, and preferably at

4070 Angstrom in a temperature range of 40-130 C, and preferably at 130 C. This method prevents the oxidation of ammonia to NO occurring in the catalytic decomposition of NO2. Thus, air containing 1.5 ppm NO2 was irradiated to give complete decomposition of NO2.

**40704** **APTIC NO. 63199**

Nikoforova, N. K.

COMPLEX EVALUATION OF THE FACTORS DISTORTING THE AEROSOL SIZE DISTRIBUTION FUNCTION AS MEASURED BY THE AELITA INSTRUMENT. *(Kompleksnyy uchet faktorov, iskazhayushchikh funktsiyu raspredeleniya aerozolya po razmeram pri izmerenii yeye priborom Aelita). Text in Russian. Inst. Eksp. Meteorol., 4(38):105-110, 1973. 6 refs.*

The complex assessment of the factors distorting the aerosol size distribution function measured by the Aelita instrument is presented. Distortions in the aerosol size distribution function as measured by this type of instrument may be due to the inhomogeneity of the light intensity in the counter space, to the simultaneous presence of two particles in the counter space, and to low light intensity. Formulae describing the degree of distortion due to these individual factors are presented. The Aelita instrument is of acceptable accuracy within wide ranges of the size distribution and concentration parameters.

**40705** **APTIC NO. 64609**

Pitts, James N., Jr., Hartmut Fuhr, Jeffrey S. Gaffney, and John W. Peters

CHEMILUMINESCENT REACTIONS OF PEROXYACETYL NITRATE AND OZONE WITH TRIETHYLAMINE. POSSIBLE ATMOSPHERIC MONITOR FOR PEROXYACETYL NITRATE. *Environ. Sci. Technol., 7(6):550-552, June 1973. 13 refs.*

Chemiluminescence spectra from the gas phase reactions of peroxyacetyl nitrate (maximum wavelength of approximately 650 nm) and ozone (maximum wavelength of approximately 520 nm) are obtained from reaction with triethylamine at atmospheric pressure, and the application of the method is discussed in relation to atmospheric monitoring of PAN. The two chemiluminescent reactions are easily distinguishable by optical filters, and concentrations of PAN as low as 6 ppb are detected by the technique, being nearly as sensitive as present gas chromatographic techniques. Improvement in the light detection system may permit measurement of PAN concentrations as low as 1 ppb or less. A technique for measuring atmospheric concentrations of PAN is being devised which involves measuring the filter intensity ratio as a function of the mole fraction of PAN relative to ozone. (Author abstract modified)

**40706** **APTIC NO. 62983**

Rouillard, E. A.

CSIR SUBJECT SURVEY O/CHEM 5: ADDENDUM. DETERMINATION OF THE PARTICLE CONTENT OF FLOWING GASES. AN ANNOTATED BIBLIOGRAPHY. 1973 ADDENDUM. *Council for Scientific and Industrial Research, Pretoria (South Africa), Chemical Engineering Research Group, 52p., May 1973. 140 refs. (Addendum to document procssed as APTIC 48351)*

NTIS: PB 223613

A bibliography containing 140 references on sampling and monitoring particulate concentrations in flowing gas streams is presented as an addendum to the bibliography Council for Scientific and Industrial Research (CSIR) Subject Survey O/CHEM 5. Period coverage is from 1963 to 1973. Subject and author indices are recompiled to include all references covered thus far.

**40707** **APTIC NO. 64569**

Salzano, Francis John, Andrew Morgan Davis, Hugh Solomon Isaacs, and Leonard Newman

DETERMINATION OF SULFUR OXIDES IN GASES. *(Verfahren und Vorrichtung zur Messung der Aktivitaet von Schwefeloxyden). Text in German. (U.S. Atomic Energy Commission, Washington, D. C.) W. Ger. Pat. Appl. 2,260,193. 12p., June 14, 1973. (11 claims).*

An electrochemical cell for the detection of sulfur dioxide in air or oxygen containing gases consists of a SO2 test electrode and a SO2 reference electrode in closed quartz tubes (permeable to sodium) connected by and filled with a molten eutectic at 500-800 C consisting of potassium sulfate 3.5, lithium sulfate 78, and soiium sulfate 8.5 mole %. The test and reference gases differ only in their SO2 contents. The emf. of the cell was a linear function of log SO2 concentration in the ppm range. The invention can be also used to detect sulfur trioxide.

**40708** **APTIC NO. 62969**

Seger, Guenter

THE USE OF LASER SOURCES FOR THE DETECTION OF PARTICULATE POLLUTANTS IN AIR. *(Die Anwendung von Laserlichtquellen zur Kontrolle der Luft auf partikelfoermige Verunreinigungen). Text in German. Messtech., no. 5:142-148, 1973. 8 refs.*

The general principle of light-scattering photometry, and the practical uses of different kinds of lasers for the determination of particulate pollutant concentrations are presented. Laboratory instruments are suitable for the particle size and concentration analysis of aerosols with a minimum size of 0.09 micron. The size of cloud particles can be studied by means of aircraft instruments in a diameter range of 10-100 microns. The surface of aerosol particles can be determined from the extent of the surface-dependent laser attenuation the particles produce in the gas laser resonator space. The laser is also suitable for the deposition-proportional detection of fine dust, as well as for the differentiation between differently shaped particles, e.g., more or less round particles and asbestos fibers.

**40709** **APTIC NO. 63358**

Smith, Kenneth Burton and Shaul Gladstone

APPARATUS FOR CONTINUOUSLY MONITORING AIR POLLUTION. *(Argus Chemical Corp., Brooklyn, N. Y.) U. S. Pat. 3,780,566. 6p., Dec. 25, 1963. 3 refs. (Appl. March 7, 1972, 10 claims).*

An apparatus and a process for continuously and automatically monitoring and recording the amount of air pollutants in the atmosphere surrounding a manufacturing plant is described. Previously, independent atmospheric checks were made manually. The device is comprised of a multiple air sampling means positioned to sample air from different compass directions; a valve positioned in line with each air sampling means wherein each valve is in a normally closed position and is activated to the open position by an electrical signal; a means for detecting the wind direction; a means for transmitting a signal indicating the wind direction; a means for accepting the signal and using it to operate the appropriate valve which is the valve in line of the air sampling means positioned to sample air in the particular direction that the wind is blowing; an air sample analyzer; a means for drawing in an air sample from the atmosphere by drawing the air in through the air sampling means, positioned in the direction of the wind, through the open valve and into the air analyzer; and a means in the air sampler to determine the amount of a given constituent in the air.

**40710** **APTIC NO. 64451**

Solomon, P.

CONTINUOUS STACK MONITORING OF CLAUS SULFUR RECOVERY PLANTS. *Proc. Am. Petrol. Inst., Div. Refining, vol. 53:73-86, 1973. 14 refs.*

The Gulf Oil of Canada program of continuous monitoring of sulfur emissions from stack gases of modified Claus sulfur recovery plants is described. The component selection and location for the system measuring the stack gas flow and the sulfur dioxide concentration, for the computer, and for the system recording the resulting sulfur emission, are explained. The operating experience gained with the four systems now on-stream is described. Emission data can be used to measure plant recovery efficiency and to aid in optimization studies. Some installation problems, operating experience on the analyzer and flow sensors, plant optimization, and advantages of the system are described. The problems encountered so far were typical start-up bugs or due to corrosion attributed to cold spots in the same lines. In future applications, corrosion-resistant teflon will be used for the sample lines. (Author summary modified)

**40711** **APTIC NO. 62931**

Svensson, Leif T. and Thomas Lindvall

ON THE CONSISTENCY OF INTRAMODAL INTENSITY MATCHING IN OLFACTION. *Stockholm Univ. (Sweden), Psychological Labs., SW ISSN 0081-5756, No. 395, 15p., Sept. 1973. 13 refs.*

Magnitude matchings of odor intensity were obtained for hydrogen sulfide, pyridine, and dimethyl disulfide in four experiments. An equal sensation function in the form of a power function described the data. The equal sensation function validates and indicates implicitly that intensity matchings between different intramodal continua are approximately transitive and symmetric with respect to odor. (Author abstract modified)

**40712** **APTIC NO. 63335**

Tsunoda, Kazushige

A SIMPLE MEASUREMENT METHOD FOR OZONE CONCENTRATION USING VULCANIZED RUBBER PIECES. *(Karyu gomu shihen ni yoru ozon nodo kani sokuten ni tsuite). Text in Japanese. Hyogo-Kenritsu Kogyo Shikenjo Kenkyu Hokoku (Hyogo Prefect. Ind. Exp. Stn.), no. 9:29-33, 1973. 13 refs.*

The methods for measuring ozone concentration from cracks formed on vulcanized rubber pieces are reviewed in detail. Using vulcanized rubber pieces, the following tests were conducted: dimensions of sample pieces, tensile strength, and ozone deterioration. The standard deviation in thickness and width of sample pieces were 0.107 and 0.338, respectively. The extent of vulcanization and homogeneity of sample pieces were tested by tensile strength. The stress-strain curve indicated a fairly high degree of homogeneity. Using an ozone aging tester, sample pieces were exposed to 50 + or - 5 pphm ozone at 40 C under load. Width of sample pieces and tiny imperfections of the surface had an effect on the measurement result. The smoothness and cleanliness of surface are other factors causing error. The careful preparation of sample pieces by molding would eliminate the error caused by these factors. There are many other factors affecting the formation and growth of cracks, indicating the complexity of ozone deterioration. The effect of ozone concentration, temperature, elongation, flow rate of ozone, humidity, and sunlight of ozone deterioration are reviewed. For the accurate and reproducible measurement of ozone concentration using vulcanized rubber pieces, the careful preparation of sample and considerations to other factors are essential.

**40713** **APTIC NO. 62988**

Tucker, Huel C. and Joseph Cheng

AN INSTRUMENT FOR SIMULTANEOUS MONITORING. NOX AND SO2 IN STATIONARY SOURCES. *Mosanto Research Corp., Dayton, Ohio, Dayton Lab., Environmental Protection Agency Contract 68-02-0554, Program Element 1A1010, Rept. EPA-650/2-73-027, 45p., Oct. 1973.*

NTIS: PB 231084/AS

Results are reported for an attempt to convert a Monsanto Model 3409 chemiluminescent ambient air monitor to a two-channel configuration for simultaneously monitoring nitrogen oxides and sulfur dioxide in stack gases. Channel separation was obtained by means of narrow-optical filters, and the analog sample-hold part of the automatic zero circuit was replaced by a digital memory circuit. A permeation dryer was included to remove water from the sample. All attempts to simultaneously measure NOx and SO2 using an ozone generator with a thermal decompsotion chamber to generate atomic oxygen failed. A chemiluminescence instrument based on atomic oxygen to simultaneously monitor stationary emission sources for NOx and SO2 is impractical with the present state of the art.

**40714** **APTIC NO. 64581**

Wartburg, Arthur F., Herman D. Axelrod, Ronald J. Teck, Miles D. LaHue, and James P. Lodge, Jr.

APPLICATION OF DIFFERENTIAL FLOW CONTROLLERS TO ATMOSPHERIC SAMPLING. *Anal. Chem., 45(2):423-424, Feb. 1973. 3 refs.*

The application of a differential flow controller for sampling of atmospheric gases is presented along with studies of the reproducibility of flow rate relative to upstream and downstream pressure changes. A differential flow controller containing a 2 psi spring and requiring a constant upstream pressure is described for regulation of sampling flow rates of 0.150 l/min. The experimental data indicate that a 46 Torr change in the upstream side (bubbler) pressure drop produces a change of 8.9% in the flow rate. Upstream pressures are not normally expected to vary more than 20 Torr in sample evaporation during actual practice, and this variation represents a 3.2% error which is quite acceptable. The flow controller can be calibrated using a soap bubble flow meter.

**40715** **APTIC NO. 63341**

Webster, Harold F. and Lawrence A. Harris

OZONE GAS DETECTOR. *(General Electric Co., Schenectady, N. Y.) U. S. Pat. 3,778,229. 5p., Dec. 11, 1973. 4 refs. (Appl. March 29, 1972, 1 claim).*

A device for detecting ozone gas in the atmosphere, composed of a small, simple, low cost sensor and circuit for providing a signal indicating the presence of a particular level of the ozone, is described. A tubular substrate of high electrical resistivity is provided with a metal oxide coating whose resistance increases signficantly with ozone concentration in the atmosphere. Electrodes connected to the metal oxide coating at the tube ends provide a means for connection to an electronic circuit for obtaining a signal of level sufficient to operate a meter or alarm device. The object of the invention is to provide an inexpensive, small, simply constructed ozone gas detector having a relatively low operating temperature to insure long life for the detector.

**40716** **APTIC NO. 62952**

(Inventor not given.)

DETECTOR FOR GASES AND DUST. *(Gasspuer- bzw. Staubspuer und -messgeraet). Text in German. (Draegerwerk AG, Luebeck (West Germany)) W. Ger. Pat. Appl. 2,141,496. 10p., March 1, 1973. (Appl. Aug. 19, 1971, 4 claims).*

An apparatus for the sampling and detection of gases and dust in air is described. The apparatus is composed of a vacuum chamber with several manometers as a suction device which is optionally connected with the measuring vessel or with a vacuum pump via an electrically controlled automatic reversing valve. Whenever the pressure falls below a preset value the connection between the vacuum chamber and the vacuum pump is closed, and whenever the pressure exceeds a preset value the connection between the vacuum chamber and the vacuum pump is opened.

**40717** **APTIC NO. 63079**

American Society for Testing and Materials, Philadelphia, Pa.

STANDARD METHOD OF TEST FOR C1 THROUGH C5 HYDROCARBONS IN THE ATMOSPHERE BY GAS CHROMATOGRAPHY. *Annual Book ASTM Stand., vol. 23:950-958, 1973. 8 refs.*

A standard method of test for carbon 1 through C5 hydrocarbons in the atmosphere by gas chromatography is presented. The measurement provides data for assessing atmospheric hydrocarbon pollution from motor vehicles, filling stations, petroleum refineries, and a variety of industrial processes employing solvents. The method is suitable for determining photochemically reactive hydrocarbons in the atmosphere, the hydrocarbon contamination in breathing air tanks, and in workroom atmospheres. Because ethylene is phytotoxic and the olefins are generally photochemically reactive, a gas chromatographic column is desirable that resolves completely all components of an air sample up to a reasonable high C number. The effort to obtain atmospheric hydrocarbon data is based upon the desire to accumulate information concerning prevalent regional air quality. The lower limit of measurement is 0.01 ppm by volume. Elution of 17 hydrocarbons is accomplished within 16 min.

**40718** **APTIC NO. 63080**

American Society for Testing and Materials, Philadelphia, Pa.

STANDARD METHOD OF TEST FOR RELATIVE DENSITY OF BLACK SMOKE (RINGELMANN METHOD). *Book ASTM Stand., vol. 23:1040-1045, 1973. 2 refs.*

A standard method of test for the determination of relative density of black smoke using the Ringelmann method is presented. The Ringelmann Smoke Chart, indicating shades of gray by which the density of smoke rising from stacks may be compared, is used to determine the density of the black smoke. The Ringelmann Chart was originally intended as a guide for plant operators in adjusting furnaces to burn coal efficiently. Since the emission of soot is an inherently preventable act of pollution, it was then adopted by many jurisdictions as a basis of air pollution control regulations. Ringelmann readings tend to correlate closely with adverse public reaction to the sight of a discharge of black smoke, and probably less well with the potential of that smoke to degrade visibility. Ringelmann readings are a subjective test, and may or many not be a direct measure of the quanity of emission.

**40719** **APTIC NO. 63081**

American Society for Testing and Materials, Philadelphia, Pa.

TENTATIVE METHOD OF TEST FOR SULFUR OXIDES IN FLUE GASES (BARIUM CHLORANILATE-CONTROLLED CONDENSATION METHOD). *Book ASTM Stand., vol. 23:1046-1053, 1973. 9 refs.*

A tentative method of testing for high precision determination of sulfur oxides emissions in flue gases is presented. This method is applicable to the determination of sulfur dioxide (26 to 7950 mg/cu m or 10 to 3000 ppm) and sulfur trioxide (33 to 9990 mg/cu m or 10 to 300 ppm). A 25-liter flue gas sample containing about 30 mg/cu m or 10 ppm by volume of sulfur oxides will yield in absorbance at 630 nm of twice the blank value for a 1 cm cell. Higher concentrations of either SO2 or SO3 may be determined by suitable aliquoting provided that the sulfate concentration in the final solution is within the region where Beer s law applies (up to 350 micrograms sulfate/ml).

**40720** **APTIC NO. 63084**

American Society for Testing and Materials, Philadelphia, Pa.

TENTATIVE RECOMMENDED PRACTICE FOR GENERAL AMBIENT AIR ANALYZER PROCEDURES. *Book ASTM Stand., vol. 23:1054-1060, 1973. 17 refs.*

A tentative recommended practice for ambient air analyzers used in determining air quality is presented. The actual method, or analyzer chosen, depends on the ultimate aim of the user, whether it is for regulatory compliance, process monitoring, or to alert the user of adverse trends. The procedure presents definitions and terms, sampling information, calibration techniques, methods for validating results, and general comments related to ambient air analyzer methods of analysis.

**40721** **APTIC NO. 63085**

American Society for Testing and Materials, Philadelphia, Pa.

STANDARD RECOMMENDED PRACTICE FOR ROTAMETER CALIBRATION. *Book ASTM Stand., vol. 23:1036-1039, 1973. 3 refs.*

The standard recommended practice for the calibration of variable area flowmeters (rotameters) used to determine air sample volumes at or close to ambient conditions of pressure and temperature, in the analysis of atmospheres for pollutant content is presented. There are two alternative methods of performing the required volume determinations for rotameter calibrations: the water sealed rotating drum meter and the volumetric gasometer. Choice of method depends primarily on which equipment is available. Higher accuracy is possible with the gasometer. The accuracies of the methods of atmospheric analysis, for which the calibration procedure is intended, do not warrant the very highest possible accuracy in flow measurement.

**40722** **APTIC NO. 63088**

American Society for Testing and Materials, Philadelphia, Pa.

STANDARD METHOD OF TEST FOR AVERAGE VELOCITY IN A DUCT (PITOT TUBE METHOD). *Book ASTM Stand., vol. 23:1018-1030, 1973. 6 refs.*

A standard method of test for measurement of average velocity of a duct using a pitot tube method is presented. The method covers the instrumentation, equipment, and operational procedures necessary for the measurement and calculation of the average velocity of air or gas flows in flues, ducts, or stacks utilizing the pitot tube principle with a manometer or draft gauge for pressure measurement. Deviations from steady state do occur. The method discusses and indicates the relative effect of deviations from steady state, for the various factors that contribute to the calculation of an average velocity.

**40723** **APTIC NO. 63089**

American Society for Testing and Materials, Philadelphia, Pa.

TENTATIVE METHOD OF TEST FOR CARBON MONOXIDE IN THE ATMOSPHERE (CONTINUOUS MEASUREMENT BY NONDISPERSIVE INFRARED SPECTROMETRY). *Book ASTM Stand., vol. 23:1032-1035, 1973. 1 ref.*

A tentative method of test for the continuous analysis and automatic recording of the carbon monoxide content of the atmosphere is presented. The measuring principle makes use of absorption of radiation by CO in the infrared region. An atmospheric sample is introduced into a sampling system of a nondispersive infrared spectrometer. The spectrometer measures the absorption by CO by difference using two parallel infrared beams and a selective detector. The detector signal is electrically transmitted to an amplifier control section. The output is measured on a meter and recording system. Concentration of CO in the sample is determined from a calibration curve prepared from mixtures of standard calibration bases.

**40724** **APTIC NO. 63095**

American Society for Testing and Materials, Philadelphia, Pa.

PROPOSED METHOD OF TEST FOR INORGANIC CHLORIDE IN THE ATMOSPHERE. *Book ASTM Stand., vol. 23:1061-1064, 1973. 8 refs.*

A proposed method of test for the volumetric determination of water soluble inorganic chlorides in the atmosphere in a range from 0.1 mg/cu m to 20,000 mg/cu ml is presented. The method is applicable to measurement of hydrochloric acid in polluted air and for soluble particulate chloride like sea spray. It is not applicable to the determination of iasoluble particulate chloride and certain organic chloride compounds which require more drastic treatment in order to release the chloride. The gas sample is adsorbed in water and the resulting chloride ion is titrated with dilute mercuric nitrate solution in the presence of mixed diphenylcarbazone-bromophenol blue indicator. The end point of the titration is determined by the blue-violet color of the mercury diphenylcarbazone complex that persists after all the chloride is combined as the weekly ionized mercuric chloride.

**40725** **APTIC NO. 63097**

American Society for Testing and Materials, Philadelphia, Pa.

STANDARD DEFINITIONS OF TERMS RELATING TO ATMOSPHERIC SAMPLING AND ANALYSIS. *Book ASTM Stand., vol. 23:824-830, 1973. 1 ref.*

Standard definitions of terms relating to atmospheric sampling and analysis are presented. There are 141 terms which are briefly defined.

**40726** **APTIC NO. 63098**

American Society for Testing and Materials, Philadelphia, Pa.

TENTATIVY METHOD OF TEST FOR LEAD IN THE ATMOSPHERE BY COLORIMETRIC DITHIZONE PROCEDURE DESIGNATION. *Book ASTM Stand., vol. 23:1009- 1017, 1973. 6 refs.*

A tentative method of test for the determination of low levels of atmospheric lead by the colorimetric dithizone procedure is presented. It involves separate measurements of particulate Pb and vaporous Pb. Particulate Pb is that collected on an efficient filter, vaporous Pb is that which will pass through a 0.45 micron membrane filter or its equivalent and includes various tetraalkyl Pb compounds, their partially decomposed products, or both. The method is intended to primarily for measuring weekly averages of vaporous Pb in ambient air at concentrations below 0.5 microgram/cu m and particulate Pb in air at concentrations of 0.01 to 10.0 microgram/cu m. Special attention must be given to the selection of efficient filters containing low Pb blanks and efficient filter holders to prevent particulate Pb loss and erroneously high vaporous Pb in air analyses.

**40727** **APTIC NO. 64563**

(Inventor not given.)

DETECTOR FOR NITROGEN OXIDES. *(Pruefroehrchen zur Messung von nitrosen Gasen). Text in German. (Auergesellschaft GmbH, Berlin (Germany)) W. Ger. Pat. Appl. 2,152,986. 6p., April 26, 1973. (4 claims).*

A test tube of high shelf life for detecting high nitric oxide concentration, e.g., in automotive exhaust gases, contained a 1st layer for the oxidation of NO to nitrogen dioxide and a potassium iodide indicating layer. The 1st layer was made by impregnating calcium silicate (grain size 0.4-1 mm) 100 with chromic acid 10 g, evaporating, and adding 85% phosphoric acid 20 ml. Impregnating glass pearls (diam 0.3-0.4 mm) 100 with KI 0.3 g in water 0.25 ml, adding glycerol 0.35 ml, and Aerosil 0.5 g gave the substance used as indicating layer. The detection range of the test tube was 100-5000 ppm $NO_2$.

**40728** **APTIC NO. 64573**

(Inventor not given.)

ANALYZER FOR SULFUR DIOXIDE. *(Diskontinuierlich arbeitender Analysator fuer Schwefeldioxid). Text in German. (Werner, Alois, Nauheim (Germany)) W. Ger. Pat. Appl. 2,149,457. 14p., Apri 12, 1973. (8 claims).*

Sulfur dioxide in waste gas or flue gas was detected batchwise by an analyzer in direct contact with the waste gas pipe. The gas was passed through into the analyzer containing 2 platinum electrodes, a diaphragm, a photoconductive cell, a light source, and a reaction solution in which a definite amount of iodine had been formed by electrolysis until the blue color vanished as measured by a photoconductive cell. Sulfur contents of 0.005-1% could be detected batchwise more than 100 times in the same solution. The analyzer can be used by unskilled personnel.

**40729** **APTIC NO. 64578**

(Inventor not given.)

TEST TUBE FOR CARBON DIOXIDE MEASUREMENT. *(Pruefroehrchen zur messung von $CO_2$). Text in German. (Auergesellschaft GmbH, Berlin (Germany)) W. Ger. Pat. Appl. 2,151,693. 4p., April 19, 1973. (5 claims).*

The measuring range of carbon dioxide test tubes, useful for automotive exhaust gases, was extended by an alumina-supported potassium hydroxide prelayer. The layer was made by drying in vacuo at 100 C a mixture containing $Al_2O_3$ (0.1-0.2 mm) 100 g and KOH (28 g KOH in 72 ml water) 15 ml and moistening with $H_2O$ 1 ml. A 20 mm long bed of this mass absorbed 10 vol % $CO_2$ at test gas volumes of 0.11.

## 1972

**40730** **APTIC NO. 63074**

Adamek, E. G.

AN EFFICIENT SEPARATION OF BAP FROM BKF AND THEIR FLUOROMETRIC DETERMINATION IN AIR SAMPLES. *Preprint, American Chemical Society, Washington, D. C., 43p., 1972. 15 refs. (Presented at the American Chemical Society, Division of Water Air Waste Chemistry, National Meeting, 164th, New York, Aug. 28-Sept. 1, 1972, Paper 235.)*

A chromatographic procedure was developed by which benzo(a)pyrene and benzo(k)fluoranthene could be separated from each other in a one-step operation directly from the sample extracts, providing for subsequent or simultaneous fluorometric analysis of the two compounds without mutual interference. The direct separation method was achieved by the use of a micro-neutral alumina known as WOEIM-Grade 101. Satisfactory retention times were achieved by conditioning for 90 min in a chamber with 60% humidity at room temperature in order to attain the required de-activation. The method was used to survey the two polynuclear hydrocarbons from particulate air samples of nine urban communities in Ontario; and attempts were made to correlate differences and changes in their levels with a number of environmental conditions. Data are given for the concentrations measured at the various locations.

**40731** **APTIC NO. 64460**

Anno, Atsushi and Kuniyasu Yamabe

HYDROCARBON ANALYSIS BY GAS CHROMATOGRAPHY. *(Gasu Kuromatogurafi ni yoru tanka suiso no bunseki). Text in Japanese. Sasebo Kogyo Koto Senmon Gakko Kenkyu Hokoku (Rep. Sasebo Tech. Coll.), no. 9:95-100, Oct. 1972. 8 refs.*

The lower hydrocarbons contained in gasoline engine exhaust gas, city gas, and pyrolytic gas of paint were determined relatively quickly by gas chromatography with the following conditions: column filler, 25% squalene/diatomaceous earth; column, detector and vaporizer temperature, 50 C; carrier gas, hydrogen 78.4 ml/min; detector, hydrogen flame ionization detector. For the determination of carbon monoxide, molecular sieves 5A and thermal conductivity detector were used. Typical gas chromatograms of gasoline engine exhaust gas, city gas and pyrolytic gas of paint are given along with the calibration curves for methane, ethane, propane, n-butane, ethylene, butene-1, t-butene-2, pentene-1, isopentane and carbon monoxide. The calibration curves showed good linear relationship except the case of $CH_4$ which was interfered with by the presence of air. The determination range was 10-50 ppm, and the sensitivity was almost 100 times higher than with a thermal conductivity detector. However, this method is still inadequate for the determination of

**40732** **APTIC NO. 56725**

Brooks, Donald A.

MEASUREMENT AND CHARACTERIZATION OF PARTICLES IN WET SCRUBBING PROCESS FOR SOX CONTROL. (FINAL REPORT). *Walter C. McCrone Associates, Inc., Chicago, Ill., Environmental Protection Agency Contract EHSD 71-25, MA Proj. 2001 Program Element No. 1A2013, Rept. EPA-650/2-73-024, 100p., July 1972. 26 refs.*

NTIS: PB 225083/5AS

Results are presented for the development of a technique for size-selective, high-capacity particulate sampling to be used in measuring and characterizing the particles in a wet-scrubbing process for sulfur oxides control. Information is provided for wet-scrubbing system process variables and the efficiency of scrubbers to be used at the a Tennessee Valley Authority test station. The sampler, existing as a manually-operated bench-scale prototype, is capable not only of fractionating the particles in the desired range but also of tolerating the process stream environment. A preliminary evaluation indicated that existing hardware did not meet all requirements and that automatic sampling was more cost effective (despite higher initial costs) than manual sampling by at least 16%. Program economics, however, resulted in the decision to design a manually operated model. (Author abstract modified)

**40733** **APTIC NO. 60613**

Brosset, Cyrill

PARTICLE-BORNE STRONG ACID: OCCURRENCE, EFFECTS AND DETERMINATION METHODS. *Preprint, American Chemical Society, New York, 10p., 1972. 8 refs. (Presented at the American Chemical Society, Division of Water, Air, and Waste Chemistry, Meeting, New York, Aug. 1972.)*

Studies were conducted in Sweden concerning the occurrence, effects, and determination of particle-borne strong acid. Concentrations from marked soot episodes were recorded at four coastal stations in Sweden, and a clear relationship was found between soot and particle-borne sulfur concentrations. Deposition of strong acid in man s lower respiratory tract has been theorized to occur through two different mechanisms: the drawing of a small portion of respired sulfur dioxide into the lower airways where it is likely to oxidize to sulfuric acid and the retention of nearly all inhaled particles (and the strong acid adsorbed on them) in the size range of 0.01-7 micron in the lower airways. Sampling and analysis procedures for measuring strong acid in respirable particulates as well as sulfur dioxide in the gas phase have thus been developed for parallel use with epidemiological studies. A new method of measuring SO2 in manual sampling which is suitable for very low SO2 concentrations has been made possible by the use of an alkali-resistant membrane filter which is impregnated with potassium bicarbonate solution which quantitatively adsorbs SO2 for subsequent determination by x-ray fluorescence.

**40734** **APTIC NO. 63002**

Coroniti, Samuel C. and Anthony J. Broderick

ATMOSPHERIC MONITORING AND EXPERIMENTS: A SUMMARY OF ONGOING PROJECTS. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 13-21. 5 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

The measurements and experiments which constitute the Atmospheric Monitoring and Experiments Subprogram of the Climatic Impact Assessment Program are briefly described. Experimental platforms and geographic coverages are discussed and individual instruments are catalogued and include aircraft, balloons, satellites, and ground monitoring. The NOAA is monitoring the total ultraviolet radiation reaching the earth s surface, ozone, and turbidity at two latitudes in the U. S. for a period of 1 year. Six U. S. cities where extensive epidemiological studies have been carried out will have ultraviolet monitors for a 1-year period. A brief description of the Stratospheric Aitken Nuclei Detection Systems is included. (Author abstract modified)

**40735** **APTIC NO. 60878**

Drayson, S. R., F. L. Bartman, W. R. Kuhn, and R. Tallamraju

SATELLITE MEASUREMENT OF STRATOSPHERIC POLLUTANTS AND MINOR CONSTITUENTS BY SOLAR OCCULTATION: A PRELIMINARY REPORT. *Michigan Univ., Dept. of Aerospace Engineering and Dept. of Atmospheric and Oceanic Science, National Oceanic and Atmospheric Administration Grant NG-10-72, ORA Proj. 011023, 149p., Nov. 1972. 234 refs.*

NTIS: COM-73-10523

The feasibility of determining concentrations of stratospheric pollutants and minor constituents from satellite measurement of solar occultation absorption in the infrared was examined for the molecules water vapor, ozone, hydroxyl radical, carbon dioxide, carbon monoxide, methane, nitrous oxide, nitric oxide, nitrogen dioxide, nitric anhydride, and nitric acid; aerosols were also considered. A survey of experimentally and theoretically determined concentrations and of infrared spectral properties was made for each constituent, and atmospheric applications and estimates of stratospheric absorption were determined. Detection and measurement of the minor constituents of the stratosphere by satellite and remote sensing was determined possible by examining the absorption of solar infrared radiation along a tangent path, while the more abundant molecules appeared capable of detection by comparatively simple instrumentation. The absorption for different tangent heights was determined for some of the molecules using low or medium resolution laboratory measurements, and the absorption was complete before the tropopause was reached in the most strongly absorbing regions. The distribution, spectral properties and results of measurements of the various gases are discussed for the lower and middle atmospheres.

**40736** **APTIC NO. 63082**

Foreman, K. M.

THE GRUMMAN AIR MONITOR SYSTEM. *Grumman Aerospace Corp., Fluid Dynamics Dept., Rept. RM-559, 35p., Nov. 1972. 11 refs.*

NTIS, DDC: AD 754 008

An automated air sampling system was developed for use in any transportation vehicle to monitor local air quality. The system is particularly useful to obtain worldwide profiles of air quality. The system consists of a controller module and modular collection, and storage units, each containing five 5 l inflatable bags. The bags have the dimensional characteristics of a 26 in. suitcase and can be interconnected in series to increase the total sampling capacity of the system up to 99 each day. Automatic inflation of any one aluminum-coated mylar or teflon bag of an installed system can be programmed for any portion of a 24-hour period. The contents will be analyzed in a laboratory away from the monitoring vehicle. Operational characteristics of the equipment and the technique are given to show its suitability for the proposed applications. (Author abstract modified)

**40737** **APTIC NO. 63018**

Grissom, J. Lloyd

EMISSIONS MEASUREMENT SYSTEM FOR JET ENGINES IN ALTITUDE TEST CELLS. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd., Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 199-213. 5* *refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

An instrumentation system for the determination of selected exhaust emissions from jet engines operating under simulated flight conditions is described. The system functions over a total pressure range of 2.5 to 40 psia at the exhaust nozzle exit, and at exhaust temperatures up to 3600 R. Measured species include carbon monoxide, carbon dioxide, hydrocarbons, nitric oxide, nitrogen dioxide, nitrogen oxides, sulfur oxides, water vapor, and particulate matter. Redundant measurements of several species using different techniques are provided, and the results are discussed. Some of the analyzer types used, although perhaps suited to ambient air monitoring, are not really suited to jet engine exhaust emissions work where varying high levels of moisture, considerable particulates, and varying oxygen levels are encountered. The techniques used include non-dispersive infrared analysis, flame ionization detection, chemiluminescence, non-dispersive ultraviolet analysis, electrochemical cells, flame photometric detection, capacitance membranes, piezoelectric microbalances, gravimetric filters, and electrostatic capture grids. (Author abstract modified)

**40738** **APTIC NO. 62907**

Rao, P. Krishna

REMOTE SENSING OF URBAN HEAT ISLANDS FROM AN ENVIRONMENTAL SATELLITE. *Bull. Am. Meteorol. Soc., 53(7):647-648, July 1972. 15 refs.*

A satellite infrared radiometer was used to measure urban heat islands. The scanning radiometer had two channels: one to measure the radiation emitted from the surface in the 10.2-12.5 micron region, and the second to measure the reflected solar radiation in the 0.55-0.75 micron region. An analysis is presented of the digitized infrared data for Oct. 19, 1970 obtained over the east coast of the U. S. at about 3 am. The radiometer were able to clearly measure the effect of urban development on temperature distribution. With the increased spatial resolution of radiometers planned for the next generation of environmental earth satellites, the temperature analysis should be able to be improved to obtain more details.

**40739** **APTIC NO. 63012**

Ridley, B. A., K. H. Welge, H. I. Schiff, L. R. Megill, and A. W. Shaw

INSTRUMENTATION FOR NO MEASUREMENT IN THE STRATOSPHERE. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 146-153. (Nov. 14-17.) (Available from the National Technical Information Service.)*

An instrument was developed for making in situ measurements of nitric oxide in the stratosphere from either balloon or aircraft platforms based on the chemiluminescence produced when ozone is mixed with NO. Optimization of its performance depends on addition of sufficient O3 to the flow tube to ensure nearly complete consumption of NO, and on operation at as high a total gas flow rate and temperature as practical. The O3 will react with most of the NO in the air sample before reaching the reaction vessel if it is introduced below the inlet baffles. This mode of operation is used to provide the zero reading, since a small but detectable signal is obtained even in the absence of NO in the system. Signal intensity increased linearly with NO mixing ratio in the air sample and sensitivity increased linearly with total sample flow rate. There was a detection limit of at least 0.03 ppb at stratospheric pressures. (Author abstract modified)

## 1971

**40740** **APTIC NO. 64543**

Bibes, P.

DUST SAMPLINGS IN CEMENT-WORK CHIMNEYS. *(Les prelevements de poussieres dans les cheminees des cimenteries). Text in French. Apave, 52(176):61-67, 1971.*

A device and procedure for dust sampling in the chimneys of cement-works are described. Sampling is done with steel probes using a vacuum pump, and a venturi tube is used as the flowmeter. Dust is deposited on ceramic filters resistant to temperatures up to 400 C. Isokinetic sampling is done preferably in vertical ducts with circular rather than rectangular cross-section. The dust concentration is determined by the gravimetric method. This dust sampling method is also applicable in coal, fertilizer, and ore drying plants, boilers, waste incinerators, and foundries. In modern cement-works, recording opacimeters are being increasingly used for dust concentration measurements.

**40741** **APTIC NO. 60859**

Brown, R. A., T. D. Searl, W. H. King, Jr., W. A. Dietz, and J. M. Kelliher

RAPID METHODS OF ANALYSIS FOR TRACE QUANTITIES OF POLYNUCLEAR AROMATIC HYDROCARBONS AND PHENOLS IN AUTOMOBILE EXHAUST, GASOLINE, AND CRANKCASE OIL. (FINAL REPORT). *Esso Research and Engineering Co., Linden, N. J., Coordinating Research Council- Air Pollution Research Advisory Committee Proj. CAPE-12-68, Contract PH-22-68-Neg.38, APTD-1515, 55p., Dec. 1971. 15 refs.*

A rapid method was developed to measure benz(a)anthracene (BaA) and benzo(a)pyrene (BaP) in auto exhaust tar, gasoline, and crankcase oil. Nine other polynuclear aromatic hydrocarbons were also included in the measurement. These included: pyrene, chrysene, triphenylene, methyl BaA, dimethyl BaA, benzo(e)pyrene (BeP), methyl BaP, methyl BeP, and benzo(g,h,i) perylene. Each of the 11 compounds occurred in concentrations of 10-2000 ppm and were measured as 0.1 microgram and higher. The method can also be extended to other polynuclear aromatic (PNA) hydrocarbons, such as benzofluoranthenes, dibenzanthracene, anthanthrene, and coronene. A cyclohexane solution of the sample was extracted with aqueous caustic then eluted through a column of partially deactivated alumina and all fractions containing PNA s were combined. A portion of the PNA concentration was fractionated by gas chromatography and individual chromatographic peaks were trapped. Concentrations of individual PNA s in the trapped fractions were measured by ultraviolet absorption spectrophotometry. Analytical losses were accounted for by isotope dilution. (Author summary modified)

**40742** **APTIC NO. 62956**

Caswell, Arthur Edward

DETECTING AND DETERMINING THE CONCENTRATION OF TRACES OF CERTAIN GASES IN AIR. *(Ministry of Defence, London (England)) Brit. Pat. 1,233,915. 3p., June 3, 1971. (Appl. July 2, 1968, 8 claims).*

A method is described for detecting and determining the concentration of a gas in a sample of air. First the sample is subjected to a physical or chemical condition specific to the particular gas to produce particles. The sample is then ionized, and the positively charged ions or the negatively charged ions are removed to leave a plasma of unipolar ions in which the particles are charged by collisions with the plasma ions until they have the same electrical sign. The ions are then filtered out by passage of the air sample, and suspended charged particles are charged by collisions with which the charged particles are collected and their quantity of charge measured as an indication of the gas concentration. This method can be used to measure sulfur dioxide gas by exposure to ultraviolet radiation to produce particles of sulfur. The method can be used to measure ammonia or a primary amine by exposure to hydrochloric acid to produce particles. This method is more sensitive than previous methods.

**40743** **APTIC NO. 63092**

Cooper, Charles V., Lowell D. White, and Richard E. Kupel

QUALITATIVE LIMITS OF DETECTION OF SPECIFIC COMPOUNDS OBTAINED BY TRAPPING GAS CHROMATOGRAPH FRACTIONS WITH AN ACTIVATED CHARCOAL CAPILLARY AND ANALYZING WITH THE MASS SPECTROMETER. *Develop. Appl. Spectr., vol. 9:163-170, 1971. 12 refs. (Presented at the Annual Mid-America Spectroscopy Symposium, 21st, Chicago, Ill., June 2-5, 1970.)*

Limits of detection attainable in the qualitative analysis of specific organic compounds by gas chromatography were established by use of an activated charcoal capillary to trap the gas chromatographic fraction prior to introduction into a Bendix Time-of-Flight mass spectrometer via the hot filament probe. The gas chromatographic technique can be used to analyze pollutants in the occupational air from industrial solvents. The following limits of detection were determined in ppm: 10 for isoamyl acetate; 20, benzene; 20, 2-butanone; 20, n-butyl acetate; 10, isobutyraldehyde; 25 n-butyraldehyde; 20, carbon tetrachloride; 20, chloroform; 10, crotonaldehyde; 10, 1,2- dichloroethane; 20, p-dioxane; 50, ethanol; 25, ethyl acetate; 10, ethylbenzene; 10, ethyl ether; 25 heptaldehyde; 10, heptane; 20, hexane; 20, methylene chloride; 20, perchloroethylene; 25, proprionaldehyde; 20, isopropyl alcohol; 25, toluene; 20, trichloroethylene; 10, isovaleraldehyde; and 25, n-valeraldehyde.

**40744** **APTIC NO. 64544**

Grillot, R. and M. Mazza

ODORS. ANALYTICAL METHODS FOR THEIR DETECTION. *(Les Odeurs. Methodes analytiques de detection). Text in French. Apave, 52(175):85-96, 1971. 33 refs.*

General problems and possibilities of the subjective perception of odors and of the objective, analytical identification of odorous substances are discussed. Substances with different chemical structures may have similar odors, and all odorous substances must be volatile to be odorous. Odorous substances are generally soluble in lipids and water. General groups and radicals may confer characteristic odors to certain organic substances. Among numerous methods and devices for the subjective detection of odors, the ASTM panel method and the scentometer by Barnebey Cheney Charcoal in Columbus, Ohio, are the most reliable. While analytical methods, such as gas-chromatography, infrared spectrophotometry, mass spectrometry, and the coupling of chromatography and mass spectrometry, are unable to determine if a given substance is odorous or not, they are suitable for the separation and identification of odorous substances in mixtures, even in concentrations below the ppb range.

**40745** **APTIC NO. 64548**

Guigues, F. and P. Giacomini

THE USE OF OPTIC FIBERS IN THE CONTROL OF NUISANCES. THEIR PARTICULAR USE IN THE CONTROL OF SOME EMISSIONS IN FLUE GAS DUCTS. *(Le fibre optique face aux nuisances. Leur utilisation particuliere pour le controle de la fumivorite). Text in French. Apave, 52(175):97-103, 1971. 4 refs.*

The use of optic fibers in the control of the opacity of smoke in smoke ducts is described. Light is emitted into the flue gas duct via an optic fiber and the portion of the light reflected by the carbon particles in the smoke is received by another optic fiber placed close to the former and which is directed partly toward the other. Both optic fibers lead to an electronic box outside the flue gas duct where opacity is measured by a photocell.

**40746** **APTIC NO. 63091**

Leddicotte, G. W.

NUCLEAR ANALYSIS METHODS FOR PROBLEMS IN ENVIRONMENTAL SCIENCE... THE DETECTION AND QUANTITATION OF TRACE ELEMENTS AND SUBSTANCES. *Develop. Appl. Spectr., vol. 9:417-435, 1971. 28 refs. (Presented at the Annual Mid-America Spectroscopy Symposium, 21st Chicago, Ill., June 2-5, 1970.)*

The concentrations of trace elements in a variety of environmental substances can be measured by radioactive tracers, induced radioactivity, or nuclear reaction methods. Types of pollutants and their sources are reviewed, and analytical techniques to determining trace pollutants in the environment are discussed. Radioactive tracer methods include isotopic methods (isotope dilution, substoichiometric isotope dilution, isotopic exchange, and isotope concentration distribution), nonisotopic methods (isotope derivative, radiorelease, and radiodisplacement), and other radiometric methods (natural radioactivity and radiometric titration). Induced radioactivity methods include neutron activation analysis and charged particle (proton) activation analysis. Nuclear radiation reactions include absorption, transmission, and scattering. These methods are described, and their applications and limits of detection are listed.

**40747** **APTIC NO. 64580**

Lucero, Daniel P.

PERFORMANCE CHARACTERISTICS OF PERMEATION TUBES. *Anal. Chem., 43(13):1744-1749, Nov. 1971. 23 refs.*

The general operation and characteristics of permeation tubes in terms of their mass transport equations are examined along with their application as a means of measuring the common diffusion parameters of some material-gas combinations. Sample emission rates in the steady state, saturation, and depletion stages are analytically described, and an expression for the emission rate equilibrium time is presented which shows that the time required to restore emission rate equilibrium after a temperature change is identical to that required for initial conditioning. A relationship between tube temperature, carrier gas flow rate, and sample concentration of the carrier and at the tube outside surface is developed. The sample concentrations in calibration gases produced by permeation tubes are entirely related to temperature over a wide range of carrier gas flow and tube emission rates. (Author abstract modified)

**40748** **APTIC NO. 63076**

Penner, S. S.

USE OF LASERS FOR LOCAL MEASUREMENTS OF VELOCITY COMPONENTS, SPECIES DENSITIES AND TEMPERATURES. *Preprint, American Inst. of Aeronautics and Astronautics, New York, 17p., 1971. 51 refs. (Presented at the American Institute of Aeronautics and Astronautics Aerodynamic Testing Conference, 6th, Albuquerque, N. Mex., March 10-12, 1971, Paper 71-283.)*

The use of lasers is reviewed for local measurements of velocity components, species densities, and temperatures. The laser- Doppler velocimeter allows measurements of local velocity components through determination of the frequency shift between incident and scattered radiation. Laser-Raman scattering permits the measurements of local species densities in gas mixtures; and it is possible, in principle, to estimate aerosol concentrations from the difference between total scattered Rayleigh radiation and the sum of the species concentrations determined by Raman scattering. Lasers that are tunable over narrow frequency ranges may be used for remote probing of non- isothermal and non-isobaric gas regions through observations of frequency-dependent absorption intensities.

**40749** **APTIC NO. 62993**

Reess, Dieter

SYSTEM FOR OPTICAL CONTROL OF AIR POLLUTION BY LASER RADIATION. *(System zur optischen Kontrolle von Luftverunreinigungen in einem Grossraum). Text in German. (Siemens AG, Berlin (West Germany)) W. Ger. Pat. Appl. 2,133,080. 12p., July 2, 1971. (10 claims).*

Air pollution by carbon dioxide and sulfur dioxide in large rooms can be measured and localized by a system of laser beam transmitters and receiivers for the Raman-scattered or reflected radiation. Thus, couples of neighboring transmitters and receivers were arranged in a row, and the laser beams were emitted in parallel. The receivers registered only the Raman backscattering of the radiation emitted from the neighboring transmitter and made it possible to localize the pollution.

**40750** **APTIC NO. 64538**

Sowinski, E. J. and I. H. Suffet

CHARACTERIZATION OF A MELPAR FLAME PHOTOMETRIC-GAS CHROMATOGRAPHIC SYSTEM FOR APPLICATION TO BORON HYDRIDES. *J. Chromatographic Sci., vol. 9:632-634, Oct. 1971. 17 refs.*

Decaborane (B10H14) was used to characterize a Melpar flame photometric gas chromatographic system as a sensitive and specific boron hydride detection system. Flame emission at 546 nm was used to define optimum oxygen, hydrogen, and air flow rates. A lower detection limit of 0.71 ng B10H14, as eluted from a 3% OV-1 Chromosorb W 80/100 mesh column, was obtained. Response was linear for greater than one order of magnitude from the lower limit of detectability. (Author abstract)

**40751** **APTIC NO. 62973**

(Inventor not given.)

GAS AND DUST DETECTION APPARATUS. *(Gasspuer- bzw. Staubspuer- und -messgeraet). Text in German. (Draegerwerk, AG, Luebeck (West Germany)) W. Ger. Pat. Appl. 2,143,282. 16p., Aug. 30, 1971. (7 claims).*

A device is described for detection of gases or dust in the air. The air is drawn through a test tube by spring-spanned bellows which are placed in a chamber connected with a pressure or a sucking pump by a switch valve for intermittant generation of excess pressure or underpressure, respectively, at the side of the bellows opposite to the test air flow.

### 1968

**40752** **APTIC NO. 62998**

Spliethoff, Heinz

FLUE GAS SAMPLING SYSTEM. *(Vorrichtung zur Entnahme sehr heisser, staubbeladener Rauchgase aus Feuerungen zum Zwecke der Gasanalyse). Text in German. (Hartmann and Braun AG, Frankfurt (West Germany)) W. Ger. Pat. Appl. 1,808,886. 4p., Nov. 14, 1968. 5 refs. (2 claims).*

Hot dust-laden gas samples are extracted for analysis in this flue gas sampling system. It consists of two concentric tubes forming a water jacket in which water flows to the point in the tube and returns while the flue gas is aspired through a short injector system inside the tubes through a short cylindrical gas channel. Part of the water flow is guided to form a swirling water covering around the inner wall of the gas channel against the direction of the flow of the gas. The gas entry opening is in the form of a conical water-jacketed inlet.

### 1967

**40753** **APTIC NO. 62978**

Santoro, T., G. Stotzky, and L. T. Rem

ELECTRICAL SENSING ZONE PARTICLE ANALYZER FOR MEASURING GERMINATION OF FUNGAL SPORES IN THE PRESENCE OF OTHER PARTICLES. *Appl. Microbiol., 15(4):935-639, July 1967. 3 refs.*

Microscopic, respirometric, and electronic sizing methods for measuring germination of fungal spores were compared. With the electronic sizing method, early stages of germination (i.e., spore swelling) were detected long before germ tube emergence observed microscopically or significant changes in respiratory rates were observed. This method, which is rapid, easy, sensitive, and reproducible, also permits measuring germination of spores when similar-size particles are present in concentrations considerably in excess of the number of spores. A Coulter counter was used as the electronic sizing method. (Author abstract modified)

### 1966

**40754** **APTIC NO. 62977**

Young, Francis A. and Donald F. Adams

COMPARISON OF OLFACTORY THRESHOLDS OBTAINED ON TRAINED AND UNTRAINED SUBJECTS. *American Psychological Assoc., Proc. Am. Psych. Assoc., Annu. Conv., 74th, 1966, p. 75-76*

Since most studies of olfactory thresholds have been made on panelists or trained subjects (TS), little opportunity has arisen to compare such olfactory thresholds obtained on such subjects with those obtained on completely naive, untrained subjects (US). A comparison was made on TS and US in a large, air-conditioned bus designed as a mobile odor perception laboratory. It was transported to state and county fairs where single threshold determinations were made on volunteer fair attendees. For determination on the TS, the bus was housed in a garage on the campus of Washington State University. The apparatus and procedure are described. Concentrations of O, n, 1.6n, 2.2n, 4.8n, and 8.5n hydrogen sulfide were used, where n could have any value between 1.7 and 7.0 ppb H2S. The combined threshold for trained male subjects was significantly smaller (1% level) than for untrained males (7.878 ppb with a standard deviation of 2.697). The same results were obtained with the untrained female threshold (8.295 ppb with a standard deviation of 2.819). The combined trained threshold for males and females was significantly lower than the untrained threshold (8.074 ppb with standard deviation of 2.758). The trained threshold for males was virtually identical to the trained female threshold, while the untrained male threshold is lower than the untrained female threshold. The ascending order of presentation was preferable for the determination of an olfactory threshold.

## AIR QUALITY MEASUREMENTS

### 1974

**40755** **APTIC NO. 63385**

Albagli, A., H. Oja, and L. Dubois

SIZE-DISTRIBUTION PATTERN OF POLYCYCLIC AROMATIC HYDROCARBONS IN AIRBORNE PARTICULATES. *Environ. Letters, 6(4):241-251, 1974. 9 refs.*

An investigation of the size distribution of the total suspended particulates according to their aerodynamic diameter was conducted in a large Canadian city during the autumn-winter-spring of 1972-1973. The particulates collected in each stage of an Andersen sampler were extracted and analyzed for their benzo(a)pyrene and benzo(k)fluoranthene content. The majority of the polycyclic aromatic hydrocarbons sampled were associated with submicron particles which can be deposited deep in the alveoli of the respiratory tract. Mass median diameters for both pyrenes were less than 1 micron. (Author abstract modified)

**40756** **APTIC NO. 63261**

DeKoning, H. W.

LEAD AND CADMIUM CONTAMINATION IN THE AREA IMMEDIATELY SURROUNDING A LEAD SMELTER. *Water, Air, Soil Pollut., 3(1):63-70, March 1974. 2 refs.*

Air, soil, and vegetation samples were taken at four sites in the vicinity of a lead smelter and were examined for Pb and cadmium. The concentration of Pb at site 3 exceeded 2 micrograms/cu m more than 10% of the time, and at site 4 the value was exceeded 20% of the time. The Cd in the air was near the average U. S. concentration of less than 0.011 micrograms/cu m. The natural Pb content of vegetation is quite low, probably less than 5 ppm. In contaminated areas, the highest Pb concentrations are in the uppermost portion of the plant. The Pb may be present as surface absorbed material or some may be passed into the plant, since the particle size of airborne Pb is such that it could pass through open stomata and be deposited within the leaf. The Pb samples taken near the plant indicate extremely high values. This pollution may pose a threat to grazing animals, but probably not directly to the local residents. No Cd pollution is directly attributed to the smelter. (Author abstract modified)

**40757** **APTIC NO. 64662**

Erlenmaier, Horst and Peter Adrian

QUANTITATIVE IR SPECTROSCOPIC DETERMINATION OF CO, CH4 AND C2H2 IN THE ATMOSPHERE BY MEANS OF A LONG-PATH GAS CELL. *(Quantitative infratorspektroskopische Bestimmung von CO, CH4 und C2H2 in Aussenluft mit Hilfe einer Langweg-Gaszelle). Text in German. CZ-Chem.-Tech., 3(5):191-195, May 1974. 12 refs.*

Measurements of traffic-generated carbon monoxide, methane, and acetylene concentrations at a street corner by means of a long- path gas cell and high sensitivity infrared Beckman spectrophotometer are described. The long-path gas cell permits variations of the path by discrete steps of 1.5 m each, due to multiple reflection by three mirrors. The limits of sensitivity are 1.4 ppm for methane, 7 ppm for CO, and 0.2 ppm for acetylene. Sampling was done at 30 cm above street level. Carbon monoxide peaks appeared at 8:30 am and 5 pm with maximums of 38 ppm and 50 ppm, and minimums at 2:30 pm. The methane concentrations ranged from 2 to 4.5 ppm, largely parallel to the acetylene concentrations. While both the methane and acetylene concentrations were reduced by rain and snowfall, the CO concentrations tended to increase slightly during precipitation.

**40758** **APTIC NO. 64488**

Fleischer, M.

COMPARATIVE LEAD AND DUST CONCENTRATION MEASUREMENTS IN SAARBRUECKEN, KAISERTRASSE IN THE MONTHS JUNE JULY AUGUST 1973 (1. REPORT). *(Vergleichende Blei- und Staubkonzentrationsmessungen in Saarbruecken, Kaiserstrasse in den Monaten Juni, Juli, August 1973. (1. Mitteilung)). Text in German. Staatlichen Institut fuer Hygiene und Infectionskrankheiten Saarbruecken. Schriftenereiehe herausgegeben vom Minister fuer Arbeit, Sozialordnung und Gesundheitswesen des Saarlandes, (7):35-39, 1974. 4 refs.*

In 92 aerosol samples taken with the dust monitor FH 62 A in the Kaiserstrasse in Saarbruecken the lead concentration was determined by flameless atom absorption after preparation of the samples. The samples were mixed with 2 ml nitric acid and 1 ml hydrogen peroxide and heated to between 105 and 110 C. After 30 min heating period and another 30 min cooling period 1 ml distilled water was added. The solid part was separated by centrifuging. From the clear solution 50 microliters were taken and diluted to 2.5 ml with distilled H2O. Of the 92 examined samples 71, i.e., 77% were above the future maximum allowable emission concentration of 2.0 microgram lead/cu m air. The average dust concentration measured during the months June, July and August 1973 was 128 micrograms/cu m, the average lead concentration 2.96 micrograms/ cu m and the average percentage of lead in the dust was 2.32% by weight.

**40759** **APTIC NO. 63381**

Grob, Robert L., James J. Schuster, and Mary A. Kaiser

STUDIES OF AIR-BORNE POLLUTANT LEVELS. *Environ. Letters, 6(4):303-320, 1974. 6 refs.*

Analytical data are presented from a three month survey conducted to investigate air pollution concentration levels of hydrocarbons, photochemical oxidants, suspended particulates, and lead from various sites in a rural Eastern Pennsylvania community. Photochemical oxidants are reported as ozone, and total hydrocarbons are corrected for methane. Typical ranges found were as follows: total hydrocarbons, 0.0002-0.050 ppm; photochemical oxidants (ozone), 0.030-0.22 ppm; suspended particulates, 26-242 micrograms/cu m; and particulate lead, 0.26-1.50 micrograms/cu m. The results indicate that no pollution problem existed during the survey interval.

**40760** **APTIC NO. 64916**

Hashimoto, Shigeru, Mikihiro Kaneho, Yoshio Saiki, Shinichi Nishiyama, Yasumi Himi, Shozo Fukui, Saburo Kanno, Toshiko Koshimizu, Kazuyuki Takamatsu, and Yutaro Sekiguchi

STUDIES ON THE PRACTICAL APPLICATION OF AN ION ELECTRODE METHOD. (IV) THE CONCENTRATIONS OF CYANIDE IN AUTOMOBILE EXHAUST GAS COMBUSTION STACK GAS AND ENVIRONMENTAL AREA. *(Ion denkyokuho no jutsuyoka ni kansuru kenkyu-Jidosha haishutsu gasu, nensho haigasu oyobi seikatsu kankyochu no shian nodo). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep., Kanagawa Prefect. Environ. Cent.), no. 5:86-86-92, Feb. 1974. 2 refs.*

Practical applications are described for the measurement of cyanide ion by the ion electrode method. Data are reported for the concentration of cyanide in automobile exhaust gas under various engine operating conditions, industrial stack gas levels of CN, road concentrations of CN, and CN values in the atmosphere around a coke furnace. Cyanide levels from automobiles and industrial combustion sources are between 2.6 and 18 mg/cu m, while levels near heavy traffic arteries are less than 0.005 mg/cu m. The pollution from automobiles is not significant.

**40761** **APTIC NO. 63181**

Hesler, A. von

COMPARISON OF THE THREE NATO STUDIES. *In: Air Hygienic Meteorological Model Studies 5f the Lower Main Region. Report 5. Regional Planning Assoc., Lower Main Region, Frankfurt am Main (West Germany), p. I-XI, June 1974.*

In March 1970 the NATO partners USA, Turkey, and West Germany decided to conduct comparative studies on the extent of air pollution in selected areas of the three countries. In the U. S., the St. Louis area was selected because several air pollution control and monitoring programs were in progress. The study area occupied about 12,000 sq km with a population of about 2.3 million in 1970. In Ankara, Turkey, studies on air pollution were also made. The study area covered about 250 km with a population of 1.2 million (1969). Although the available studies had a different objective than the St. Louis studies, they were easily adapted to the development of standards for air quality. The Lower Main study, however, had an essentially different objective. It was aimed mainly at determining the influence of urban constructions and activities on climatological and air quality conditions in densely populated areas. Mathematical models were to simulate the effect of prospective urban settlements on air pollution. The study area here covered 1400 sq km with an approximate population of 1.8 million. The studies include emission inventories. A detailed description of the Lower Main study is provided in the successive chapters.

**40762** **APTIC NO. 62935**

Hinton, D. O.

RECAPITULATION OF METROPOLITAN AIR POLLUTION EXPOSURES ARISING FROM MOBILE AND STATIONARY SOURCES. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Human Studies Lab., 4p., 1974. 3 refs.*

Measurements of previous air pollution exposures and continuing air monitoring in a study community provides an exposure basis for epidemiologic studies on the health effects of ambient pollution. Sulfur dioxide, total suspended particulate and dust fall measurements for the city of Chicago and for the Chicago-Northwest Indiana Metropolitan area were obtained in recent years. Based on these measured values, it was possible to estimate past pollutant exposure in these areas for the period 1950-1970. The data sources included city, county, state, and Federal studies. Limited data were available during the earlier years of the 1950-1970 period. A consistent correlation existed between dust fall and total suspended particulates, and dust fall and suspended sulfates for those years when these measurements were available. Using this relationship, total suspended particulate and suspended sulfate exposures were estimated from dust fall for those years when only dust fall was available. Sulfur dioxide was correlatable to dust fall; however, limited data provided exposure estimates for 1960-1970. The estimates were useful in determining an exposure gradient within the city of Chicago and across the entire area. (Author abstract modified)

**40763** **APTIC NO. 64827**

Huygen, C.

DISPERSION AND REACTION OF NITROGEN OXIDES IN OPEN AIR. *(Dispersie en reakties van stikstofoxide in de buitenlucht). Text in Dutch. Ingenieursblad, 43(10):334, 1974.*

Results of systematic measurements of the nitrogen dioxide and nitric oxide concentrations and their relationship in the Netherlands are presented. Great variations in the NO concentrations in time and space, and dependence of the NO concentrations of the traffic density and of the distance from the emission source were observed. The NO2 concentrations fluctuated much less in time and space. Both the NO and NO2 concentrations were highest during rush hours, and lowest on Sundays and Saturdays. The NO/NO2 ratio was a function of the distance from the emission source, which is due to the relatively rapid conversion of NO into NO2.

**40764** **APTIC NO. 64628**

Imamura, Kiyoshi and Toru Fujii

STUDIES ON HYDROCARBONS IN THE AIR (REPORT NO. 2): VERTICAL DISTRIBUTION OF HC COMPONENTS IN THE ATMOSPHERE. *(Taikichu no tankasuiso ni kansuru kenkyu (dai2ho). Taikichu no tanka suiso seibun no rittai bunpu). Text in Japanese. Preprint, Japan Chemical Society, Tokyo, p. 682, 1974. (Presented at the Japan Chemical Society, Spring Meeting, 30th, Higashi-Osaka, April 1-4, 1974, Paper 1C27.)*

The components of aliphatic hydrocarbons and aromatic hydrocarbons in the upper atmosphere of Osaka were examined. The vertical distribution was also examined by taking samples at 300 and 600 m altitudes using an airplane. The air was sampled into mylar bags, avoiding the airplane exhaust by mylar pump. As control area samples, air samples on a busy traffic road and on the top of a four story building were taken. Samples were taken everyday at 8 and 11 am and 2 pm for 10 days. The HC compositions were analyzed by gas chromatography. The components identified were: ethane, ethylene, propylene, propene, isobutane, n-butane, acetylene, butenel, isobutene, isopentane, n-pentane, benzene. toluene, ethylbenzene, m- and p-oylene, o-xylene, n-hexane, n-heptane, and n-octane. All but the last three items were quantitated. Each HC, except for ethylene and toluene was less than 10 ppb. Ethylene and toluene had both relatively high concentration for both ground and upper altitude. There was no large variation in concentrations by altitude, nor the location of smapling whether it was above the sea or the land. This shows the fact that HC in the city air diffuses into a large area, and the atmosphere surrounding a city is very much polluted generally by various emission sources. Within the measuring altitudes, ethylene ratio increased with the increase of the altitude, and ethylene emission sources other than automotive exhaust must be examined.

**40765** **APTIC NO. 62918**

Johansson, Thomas B., Rene E. Van Grieken, and John W. Winchester

ELEMENTAL ABUNDANCE VARIATION WITH PARTICLE SIZE IN NORTH FLORIDA AEROSOLS. *In: Multi-Element Trace Analysis by Proton Induced X-ray Emission. Thomas B. Johansson (ed.), Lund, Sweden, May 20, 1974, Chapt. 6, p. 57-73. 15 refs.*

The variation of elemental abundance with particle size was determined in aerosols from North Florida sampled near the ground by a five-stage impactor in largely unpolluted inland and coastal locations. Dispersion of clay and limestone soil components, sea spray, gas-to-particle conversion reactions, organic processes associated with heavy forest cover, and air pollution by combustion in automotive and stationary sources are important local aerosol sources, and sampling locations were chosen to reflect their varying contributions. The 32 separate distributions, as determined by proton-induced X-ray emission, suggest that iron and titanium originate mainly from a soil source, distinct from that of calcium which disperses to coarser particles, but potassium appears to be derived from at least three important sources. Compared with iron, both lead and bromine mainly occur on much finer particles and apparently are both local fuel combustion products, in contrast to chlorine, which is found mainly on large particles as expected if it is derived from sea salt. The size distributions of sulfur and iron, although different, are relatively invariant over all samples collected, except very near the sea coast, suggesting for particulate sulfur, mainly a natural terrestrial vapor-to-particle conversion process. Copper, zinc, and manganese all show increasing enrichment relative to iron with decreasing particle size, suggesting source processes involving the vapor phase. The relationships revealed in this model study of a natural atmosphere underlie those of more

**40766** **APTIC NO. 64919**

Kerteszne-Saringer, Magdolna, Erno Meszaros, and Zoltan Morlin

DEPOSITION OF POLYCYCLIC HYDROCARBONS OF ARTIFICIAL ORIGIN. *(A mesterseges eredetu karcinogen policiklusos szenhidrogenek kiulepedese a legkorbol). Text in Hungarian. Egeszegtudomany, 18(1):1-8, 1974. 6 refs.*

Deposition rates and polycyclic hydrocarbon content were investigated for atmospheric dust contamination in Budapest. Deposition rate of all dust particles and all polycyclic HC in km/day was 0.60 and 0.40 for dry days and 1.47 and 0.09, respectively, for wet days. Average time of total dust presence in the atmosphere on dry days was 1 day, while that of HC was 15 days; on wet days the staying period was about half these values. Considering the average wind speed in Budapest, the total dust contamination may range as far as 173 km on dry days, with HC reaching as far as 2500 km from the contaminating source. The contamination distance is much less on wet days. The average polycyclic HC content of deposited dust was 0.1%, while that of wafting dust was 1.6%.

**40767** **APTIC NO. 61510**

Kodama, Yasushi, Rinko Urabe, and Shin Ishinishi

A CONSIDERATION OF AMOUNTS OF BENZO(A)PYRENE AND METALS IN URBAN SUSPENDED PARTICULATE. *(Toshi fuyujin-chu benzo(a)piren ryo to kinzokuryo ni kansuru kosatsu). Text in Japanese. Nihon Eiseigaku Zasshi (Japan. J. Hyg.), 29(1):115, April 1974. (Presented at the Japanese Society for Hygiene, General Meeting, 44th, Nagasaki, Japan, April 2-4, 1974, Paper 206.)*

The chemical composition of dust fall and suspended particulates was determined in Kitakyushu, an industrial area, and Fukuoka, a commercial area. High volume air samplers were placed along main roads and in the center of each city and measurements were taken every 6 hr for 3 days. Benzo(a)pyrene and metals were determined by spectrophotometry and chromatography. There was a statistically significant correlation of 1% between the B(a)P concentrations and the lead and manganese concentrations in Fukuoka, but no correlation betwen B(a)P and iron and cadmium. There was no correlation between the B(a)P levels and the concentrations of other metals in Kitakyushu.

**40768** **APTIC NO. 63186**

Lahmann, E.

AIR QUALITY MEASUREMENTS OF THE INSTITUTE FOR WATER-, SOIL-AND AIRHYGIENE. *In: Air Hygienic Meteorological Model Studies of the Lower Main Region. Report 5. Regional Planning Assoc., Lower Main Region, Frankfurt am Main (West Germany), p. 100-115, June 1974.*

At three measurement stations in the center of Frankfurt, in the east of Frankfurt, and in Hattersheim air was drawn for one hour through an impinger and the concentration of chloride, fluorides and phenols determined. For measurements of the dust concentration high volume samplers were used. The lead analyses of the dust were carried out by atomic absorption spectrometry. In addition the sulfur dioxide and oxides of nitrogen concentrations were determined in random samples. In the year 1972/73 the maximum daily average of SO2 was 201, of nitrogen dioxide 81, of phenol 13, of fluoride 0.98, of formaldehyde 23 of chloride 30, of dust 730, and of lead 7.51 micrograms/cu m. The annual average concentration of SO2 was 71, of NO2 48, of phenol 6, of fluoride 0.45, of formaldehyde 5, of chloride 16, of dust 220, and of lead 7.51 micrograms/cu m. The emissions measured in 1972/73 were in most cases lower than during the previous year. This is true for both the annual averages and the maximum daily averages. Of the pollutants, only SO2 was clearly higher in the center of Frankfurt than at the other stations. Formaldehyde exceeded, in two instances, the existing long-term maximum allowable emission concentration of 30 micrograms/cu m.

**40769** **APTIC NO. 63184**

Markusch, H., D. Jost, R. S. Kaller, and W. Rudolf

AIR QUALITY MEASUREMENTS. *In: Air Hygienic Meteorological Model Studies of the Lower Main Region. Report 5. Regional Planning Assoc., Lower Main Region, Frankfurt am Main (West Germany), p. 48-92, June 1974. 10 refs.*

Three institutes assumed the task of carrying out a series of measurements on air quality: the Meteorological and Geophysical Institute of the University of Frankfurt, the Monitoring and Testing Agency of the Trade Inspection Office of the Land Hessen, and the Institute for Water-, Soil- and Air- Hygiene in Berlin. The measurements taken by the Meteorological and Geophysical Institute of the Frankfurt University are described in detail. The central measuring station is in the Institute which is located one km from the city center. It measures the carbon dioxide, carbon monoxide, sulfur dioxide, nitrogen oxides, hydrocarbon and particulate concentrations along with the wind direction, wind speed, temperature, relative humidity, atmospheric pressure, and radiation balance. The station Offenbach in the east measures the CO2, CO and SO2 concentrations, the station Frankfurt-Nied in the West the CO2 and SO2 concentrations, the station Nieder-Erlenbach in the north measures SO2, and the stations Neu-Isenburg in the south, Hattersheim in the southwest, and Gros-Krotzenburg in the southeast also measure SO2. The city station Rundschauhaus measures the carbon monoxide, hydrocarbon, nitric oxide, nitrogen dioxide, and ozone emissions from automobiles. The city station Rathenauplatz measures CO emission from traffic. The analyzers used for the various measurements are described in detail. The SO2 concentrations measured within the study period July 1972 to June 1973 did not exceed the emission limits of the new technical directives for the maintenance of clean air. The arithmetic mean measured at the central station was 42 ppb, the 60% value 37 ppb and the 95% value 92 ppb. For dust as well as for SO2 concentrations the maximum was measured in the heating period, the minimum in the summer period. The oxides of nitrogen concentrations of 51.4 ppb (annual average) and 148 ppb (maximum diurnal average) exceeded the standard values of the Air Quality Standards. The CO concentration varied greatly with time and location. If the 50% and 97.5% values of the sum frequency distribution are used for describing the seasonal and local differences, the concentrations for the central stations in the heating period are 1.9 and 6.9 ppm, and for the city-station Rathenauplatz 5.3 and 15.8 ppm. The respective values for the summer period are 0.9 and 4.8 ppm and 2.1 and 10 ppm.

**40770** **APTIC NO. 63231**

Neiser, Jan and Vaclav Masek

PYROCHROMATOGRAPHY FOR INDENTIFICATION OF TAR SUBSTANCES FROM THE AIR OF COKING PLANTS. *(Pyrochromatographie als Charakteristik der Teersubstanzen aus der Luft der Kokereien). Text in German. Gesundh.-Ingr., 95(6):168-171, 1974. 3 refs.*

Tar substances, i.e., the benzene-soluble fraction of fly dust emitted by coking plants, were separated in a silver membrane filter and through benzene extraction and pyrolyzed. The components were then identified by gas chromatography. From the identified hydrocarbons the thermal changes of the original fly dust samples could be evaluated. Basic analyses and scanning electron microscope pictures of the fly dust samples as well as basic analyses of the tar substances are presented. A total of 55 peaks could be identified up to diphenyl, but higher boiling substances could not be identified with certainty.

**40771** **APTIC NO. 64777**

Nishida, Konosuke, Hiroshi Yasui, Tsuneo Moto, and Kuniyoshi Seno

INVESTIGATION OF VARIOUS EMISSION GASES AT A FILM PRINTING PLANT. *(Bo furumu insatsu kojo kaku gasu chosarei). Text in Japanese. Akushu No Kenkyu (Odor Research J. Japan), 3(15):10-17, June 1974.*

Gases from printing machines in a printing room and in a solvent mixing room were sampled with plastic bag and analyzed by flame ionization detector. From air collected 50 cm above the no. 2 and no. 3 machines, 4 components including ethyl alcohol, toluene, isopropyl alcohol, and isobutyl acetate were detected. The concentrations of the first two components were 200 ppm and 40 ppm, respectively, and they represented 99% of the total substances in the air. The air collected near the ceiling above the two machines showed 200 ppm of ethyl alcohol and 60 ppm of toluene, comprising 97% of the total substances. The same 4 components were detected in the gas ducts from the machines but the concentrations were much higher: 900 ppm ethyl alcohol and 170 ppm toluene. The solvent contained 65.33% toluene, 29.20% ethyl alcohol, 4.38% isobutyl acetate, and 1.09% isopropyl alcohol. The higher concentration of ethyl alcohol in air was attributed to its higher volatility. Odor was tested by diluting with air (79% N2, 21% O2) until it became insensible. Gas collected near the ceiling above the no. 2 and no. 3 machines was diluted 2000 times before becoming insensible.

**40772** **APTIC NO. 63195**

Otterman, Joseph, Avihu Ginzburg, George Ohring, and Yuri Mekler

OBSERVATIONS OF WATER, AIR AND SOIL POLLUTION IN ISRAEL AND VICINITY FROM THE ERTS-1 IMAGERY. *Water, Air, Soil Pollut., 3(1):53-61, March 1974. 12 refs.*

Israel is a participant in the Earth Resources Technology Satellite Program (ERTS). The imagery of Israel and vicinity taken by the Multi-Spectral Scanner of the ERTS-1 Satellite was the subject of analysis in a multidisciplinary research program. The objectives of the program are mapping of agricultural crops (mainly wheat and orange groves), mapping of natural vegetation, and studies of Israeli hydrology, arid regions research, geology, and oceanography. Cases of water, air, and soil pollution were observed in the imagery on several dates, and are reported. These are: oil slicks in the Gulf of Suez and possibly near Haifa; smoke plumes, extending over some 100 km in a nearly straight line along the Gulf of Suez; and soil pollution caused by copper mine effluents in the Arava Valley in Israel. The images of these cases of pollution are presented, and space signatures, i.e., the radiometric spectral characteristics of these cases of pollution as seen from space, are also given. (Author abstract)

**40773** **APTIC NO. 63126**

Patterson, Ronald K. and Jack Wagman

MASS AND COMPOSITION OF AN URBAN AEROSOL AS A FUNCTION OF SIZE FOR SEVERAL VISIBILITY LEVELS. *Preprint, American Chemical Society, Los Angeles, Calif., Div. of Environmental Chemistry, 6p., 1974. (Presented at the American Chemical Society, Division of Environmental Chemistry Meeting, Los Angeles, Calif., April 1974.)*

Results are presented from a study to determine to what extent variations in aerosols mass, composition, and size distribution accompany variations in visibility in an urban area. An integrating nephelometer was used to monitor visibility and four sets of aerosol samples were taken during different visibility conditions. Measurements of concentration as a function of a particle size were made for total mass, sulfate, nitrate, chloride, ammonium, lead, iron, magnesium, and zinc from samples collected with Andersen cascade impactors. Measurements of mass and carbon, hydrogen, and nitrogen were made from samples collected with High Volume samplers. Mass concentration increased as visibility decreased. Based on log probability plots, sulfate, ammonium, and lead all had mass median diameters equal to or below 0.5 micron regardless of visibility level. The MMD for nitrate ranged from 0.03 - 1.34 micron, the MMD for chloride from 0.43-1.13 micron, and the MMD for zinc from 0.87-1.61 micron. The MMD for iron and magnesium were 4.00 micron or above for all cases.

**40774** **APTIC NO. 63143**

Quarles, John

MISCELLANEOUS AMENDMENTS. *Federal Register, 39(116):20790-20794, June 14, 1974.*

Revisions of standards of performance for new and modified stationary sources (fossil fuel fired steam generators, incinerators, portland cement plants, nitric acid plants, and sulfuric acid plants) are presented. The revisions cover applicability, definitions, standard for particulate matter, standard for sulfur dioxide, standard for nitrogen oxides, test methods and procedures, monitoring of operations, and standard for acid mist.

**40775** **APTIC NO. 63166**

Renoux, A. and G. Tymen

GRANULOMETRIC DISTRIBUTION OF AEROSOL PARTICLES LARGER THAN 0.3 MICRON IN MARITIME AND CONTINENTAL ATMOSPHERE. *(Repartition granulometrique des aerosols de diametres superieurs a 0.3 um en atmospheres maritime et continentale). Text in French. Chemosphere, 3(2):49-52, April 1974. 3 refs.*

The influence of maritime and continental atmospheres on the granulometric distribution of aerosol particles larger than 0.3 micron was studied by systematic air sampling by means of a four-stage Casella cascade impactor. A reduced concentration of fine particles in maritime atmosphere and increased concentrations of larger particles captured on the first three stages of the cascade impactor in continental (urban) atmosphere were determined. The values of the coefficient B according to Junge s law, as determined for the size ranges of 0.3-4 micron, 4-40 micron, and over 40 micron in maritime atmosphere are 1.8; 2.7, and 4.9. The corresponding values determined for the size ranges of 0.3-4 micron, 4-30 micron, and over 30 micron in urban atmosphere are 3.5; 2.9, and 6.

**40776** **APTIC NO. 64638**

Rumler, F., H. Neis and R. Herbolsheimer

DUST FALL MEASUREMENTS IN THE AREA SAARBRUECKEN-VOELKLINGEN - SAARLOUIS-DILLINGEN AND NEUNKIRCHEN IN THE PERIOD FROM MAY 1, 1972 TO APRIL 30 1973 (SIXTH MEASUREMENT YEAR). *(Staubniederschlagsmessungen im Raum Saarbruecken-Voelklingen- Saarlouis-Dillingen und Neunkirchen fuer die Zeit vom 1.5.1972 bis 30.4.1973 (6. Messjahr)). Text in German. Staatlichen Institut fuer Hygiene and Infectionskrankheiten Saarbruecken. Schriftenreihe herausgegeben vom Minister fuer Arbeit, Sozialordnung und Gesundheitswesen des Saarlandes, (7):10-22, 1974.*

The results of dust fall measurements taken in the sixth consecutive year at a total of 211 measuring points in the area Saarbruecken-Voelklingen-Saarlouis-Dillingen and at 39 measuring points in Neunkirchn are presented. The location of the measuring stations is shown in a map. The results are listed in tables and illustrated in graphs. For the first time a marked drop of the dust fall was recorded. It dropped also in the area Dillingen und Neunkirchen-Bexbach, where in 1971/72 a slight increase was still recorded. In the area Saarbruecken Dillingen spanning an area of 111 sq kilometers the long term emission went down from 0.80 g/sq m day in 1971/72 to 0.58 g/sq m day in 1972/73, the short-term concentration dropped from 1.75 to 1.28 g/sq m day. In Neunkirchen-Bexbach covering 29 sq km the long-term concentration went down from 0.51 to 0.42 g/sq m day, the short-term concentration from 1.13 to 0.95 g/sq m day. In Saarbruecken alone, covering an area of 35 sq kilometers, the concentrations dropped from 0.90 to 0.57 and from 2.09 to 1.24 g/sq m day. These reductions of the dust fall are due to measures taken by the metallurgical industry in the area. The favorable meteorological conditions in the 1972/73 might also partly account for the reduction.

**40777** **APTIC NO. 63397**

Stasiuk, William N., Jr. and Peter E. Coffey

RURAL AND URBAN OZONE RELATIONSHIPS IN NEW YORK STATE. *J. Air Pollution Control Assoc., 24(6):564-568, June 1974. 24 refs.*

High ozone concentrations, often in excess of the national ambient air quality standard for photochemical oxidants, have been measured simultaneously in urban and rural areas of New York State. Average daily rural ozone concentrations correlated well with daily maximum urban ozone concentrations suggesting a common source. Estimations of the quantity of ozone advectively transported into New York State are more than an order of magnitude greater than estimations of the potential photochemical generation of ozone from hydrocarbon emissions within New York State. High rural ozone levels are not primarily due to the transport of ozone and ozone precursors from other urban areas, but rather to natural phenomena such as photochemical generation from naturally occurring precursors or transport of ozone from the stratosphere to the troposphere. The effectiveness of a hydrocarbon control strategy for New York State to meet the ambient air quality standard for photochemical oxidants when background levels themselves may be above the standard is questioned. (Author abstract)

**40778** **APTIC NO. 64907**

Tada, Osamu

TOXIC SUBSTANCES IN WORK ENVIRONMENT. (3) EXPLODES GASES, COMBUSTION EFFLUENTS, ENGINE EMISSIONS AND VARIOUS POLLUTANTS IN AIR-CONDITIONED BUILDINGS. *(Henyo suru shokuba kankyo to yugaibutsu (3) happa gasu, nensho haigasu, enjin haiki, kucho birunai no kuki osen busshitsu). Text in Japanese. Rodo Kagaku (J. Sci. Labour (Tokyo)), 50(7):427-438, July 1974. 38 refs.*

Concentrations of toxic substances in the air were measured for dynamite and carlit explosions at various metal mines, combustion effluents from coal and oil stoves and gas furnaces, cigarette smoke, motor vehicle emissions, and indoor atmospheres of buildings with air conditioning. Data are tabulated for type and chief ingredients of dynamite and carlit used in metal mines, gases yielded by explosion of dynamite and carlit, flue gas constituents of stoves and furnaces, toxic gases from cigarette smoke, concentrations of air pollutants in automobile inspection stations, carbon monoxide concentrations and blood carboxyhemoglobin percentage estimates from expired air of automobile inspectors, air pollutant concentrations in underground parking facilities, and carbon monoxide and lead concentrations in toll road gate booths, automobile inspecting shops, and first and second basement parking areas. Pollutants measured, other than the above, include: carbon dioxide, nitrogen dioxide, nitric oxide, hydrogen cyanide, hydrogen chloride, hydrogen sulfide, sulfur dioxide, silica, lead sulfide, acetaldehyde, formaldehyde, hexane, and dust.

**40779** **APTIC NO. 64747**

Yano, Tadashi, Kieko Maebashi, and Hidetsugu Katsuragawa

AEROSOL PARTICLES IN CLEAN AIR ABOVE OCEAN. *(Kaiyo seijo taikichu no erozoru ryushi). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 10:10-13, Feb. 1974.*

A large portion of the atmospheric aerosol background consists of maritime aerosols with composition similar to that of sea water in terms of the element weight ratio of sodium and chlorine. The ratio of each element and Na in sea water is compared with that of aerosols in terms of the concentration ratio F equals (X/Na)aerosol/(X/Na) sea water, where X is the weight of each element. The samples collected on the Pacific Ocean at 300 km from the land were analyzed. The F value of Cl is approximately 1, while the F values of aluminum, vanadium, and manganese are extremely high, showing values close to those of soil particles. The analysis of maritime aerosol and urban aerosol indicates that the emission sources of Al, V, and Mn are on land. The weight contribution ratio of each emission source of submicron particles (Al, V, Na) calculated are 4-9% for man-made particles, 11-22% for soil particles, and 69-85% for sea salt particles.

**40780** **APTIC NO. 64623**

Japan Environmmental Agency, Tokyo, Environmental Protection Bureau

REPORT ON AN INVESTIGATION AND ANALYSIS OF AIR POLLUTANTS. *(Taiki osen busshitsu no chosa bunseki hokokusho). Text in Japanese. Kankocho Kogai Senmon Shiryo Public Nuisance Gaz.), 9(4):54-78, July 1974.*

Suspended particulates were sampled from the environmental atmosphere in various parts of Japan in 1973, and a special investigation committee was appointed by the Japan Environmental Agency for the quantitation of various elements. The organizations in charge of sampling the air were various governmental and semi-governmental research institutes in Hokkaido, the Inland Sea coastal area, and Gifu, Hyogo, Okayama, and Miyazaki Prefectures. Air samples were taken at 36 locations. Low volume samplers, instrumental neutron activation analysis, and radioisotope energy dispersive X-ray fluorescence analysis were employed. The elements analyzed were: sodium, magnesium, aluminum, silica, sulfur, chlorine, potassium, calcium, scandium, titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper, zinc, arsenic, selenium, bromine, rubidium, strontium, zirconium, molybdenum, silver, cadmium, antimony, cesium, barium, lanthanum, cerium, samarium, europium, ytterbium, lutecium, hafnium, tantalum, tungsten, mercury, lead, and thorium. The problems in the analysis method include the relatively short half life of Fe and Cd which requires adjustment. Cadmium requires a long spectrum measurement time, and to shorten the measurement time, the use of americium instead of Cd may be considered. In general, the amount of samples (3 - 12 mg) were too small; 20-30 mg of material, or a 1-2 mg/sq cm concentration, was desirable.

**40781** **APTIC NO. 64717**

Tokyo Metropolitan Government (Japan), Bunkyo District

OXIDANTS MEASUREMENTS AT PRIMARY AND JUNIOR HIGH SCHOOLS IN THE BUNKYO DISTRICT, TOKYO. *(Kuritsu sho-chugakko ni okeru okishidanto sokutei kekka). Text in Japanese. 50p., March 1974.*

In view of the fact that school yards are often the place of high photochemical smog incidents in Tokyo, a special investigation of oxidant level was conducted at all elementary and junior high schools in the Bunkyo district between June and October 1973. Continuous measurement was made from the roof of the district office. A simple device based on the deterioration of rubber in ozone was utilized and a cylindrical shelter with three rubber rings was left at each school. Polyisoprene rubber and styrene butadiene co-polymer rubber rings were used, and they were exchanged every week to measure the deterioration by comparing the degree of deterioration of rubber rings in a known level of ozone. Three problems with this method of investigation were: variation in the rubber quality and form, the selection of representative shelters, and the effects of weather. Various factors such as temperature, humidity, wind, and sunshine no doubt played some role in the rubber deterioration, and further development of techniques is necessary. The converted levels of oxidants ranged between 2.6 and 3.5 pphm.

**40782** **APTIC NO. 64746**

Kanagawa Prefecture Coastal Area Air Pollution Investigation Council (Japan)

REPORT ON THE INVESTIGATION OF AIR POLLUTION IN THE COASTAL AREA OF KANAGAWA PREFECTURE, 1971. *(Kanagawa-ken rinkai chiku taiki osen chosa hokokusho). Text in Japanese. 204p., Aug. 1973.*

A comprehensive survey of air pollution in the coastal area of Kanagawa Prefecture was made including the distribution patterns of sulfur oxides, oxidants, nitrogen oxides, suspended particulates, and metals, seasonal fluctuations, correlations of various measurements, geographical characteristics in metal measurements, pollution over the sea and at high altitude, meteorological conditions and pollutant concentrations, correlations of SOx and suspended particulates, representative local types and area patterns, and pollution emission sources. According to the special investigations conducted in summer 1971 and winter 1972, the SOx concentrations were lower by 10-40% in summer and by 10-60% in winter than the previous year. The pollution distribution patterns could be classified into 9 types. The SOx concentration over the sea near Kanagawa prefecture was about 1/2 of the land concentration taken at the same time. The maximum suspended particulates by high volume air sampler were 348 micrograms/cu m in summer, and 249 microgram/cu m in winter. The minimum measurements were 82 micrograms/cu m in summer and 117 micrograms/cu m in winter. The metal content in suspended particulates showed high concentrations of iron and manganese along the coast and of lead along the main highways.

**40783** **APTIC NO. 64750**

Tokyo Metropolitan Government (Japan), Nerima District

A SURVEY OF POLLUTION IN THE NERIMA DISTRICT, TOKYO. *(Kogai o nakusu tame ni - Nerima-ku no kogai no gaikyo). Text in Japanese. 96p., March 1974.*

Air pollution in the suburban Nerima district is continuously monitored for oxidant by potassium iodide absorption spectrophotometry at three locations, for nitrogen oxides by Saltzman solution spectrophotometry at one location, for sulfur oxides by electroconductivity at one location, for suspended particulates by light scattering at one location, for carbon monoxide by non-dispersive infrared spectrometry at one location, and for the wind direction and velocity by anemometer at one location. In addition, there are about 25 periodical monitoring stations. Between 1970 and 1973, photochemical smog warnings were issued 111 times and a total of 13,459 persons reported some form of physical damage. Studies are being made of the relationship between high oxidant concentration and meteorological factors in this area. The level of sulfur oxide is about 0.03 ppm by the monthly average. In spite of increases of SOx emission in January and February, the level of SOx concentration is about the same for summer and winter. This is caused by the predominant southerly wind which places the area in the lea for pollution from central Tokyo and the Tokyo-Yokohama industrial area. The ratio of hourly concentration exceeding the standard was 0.5% and that of the daily average exceeding the standard was 5% in 1973. The level of nitrogen oxides is about 0.20 mg/day/100 sq cm.

**40784** **APTIC NO. 64902**

Tokyo Metropolitan Government (Japan), Arakawa District

PUBLIC NUISANCES IN ARAKAWA (A SUMMARY), 1973. *(Arakawa-ku no kogai (gaiyo)). Text in Japanese. 162p., March 1974.*

As part of on-going public nuisance investigation programs in the Arakawa District of Tokyo, the air quality and noise were investigated in 1973. For the former, carbon monoxide, nitrogen dioxide, nitric oxide, sulfur dioxide, suspended particulates and their metal content, and the photochemical smog information communication system were investigated. The CO measurements ranged from 3 to 13 ppm; NO, 1-56 ppm; and NO2, 1 ppm. The metals analyzed by atomic absorption spectrophotometry were cadmium, lead, vanadium, chromium, manganese, nickel, iron, and copper in suspended particulates collected by high-volume sampler. The total suspended particulate concentration was from 362 micrograms/cu m to 148 micrograms/cu m, with an average of 236 micrograms/cu m. The maximum Cd concentration was 0.039 micrograms/cu m with an average of 0.022; the maximum Pb, 1.355, with an average of 0.799; the maximum V, 0.299 with an average of 0.157; the maximum Cr 0.073, with an average of 0.040; the maximum Mn, 0.601, with an average of 0.395; the maximum Ni, 0.107, with an average of 0.063; the average Fe 6.715; and the maximum Cu 0.547, with an average of 0.248 micrograms. The area is polluted with many industrial boilers and furnaces. High oxidant concentration warnings of over 0.15 ppm were given 45 times between April and September 1973, an increase of 75% over the previous year.

## 1973

**40785** **APTIC NO. 64666**

Kamiya, Akio, Toyomasa Kato, and Hiroo Mizutani

SIZE DISTRIBUTION OF AIRBORNE PARTICULATES. *(Fuyu funjinchu no kinzoku no ryudo bunpu). Text in Japanese. Nagoya-shi Kogai Kenkyushoho (Rep. Environ. Pollut. Res. Inst., City Nagoya), no. 2:27-30, 1973. 4 refs.*

The Andersen Air Sampler was used to measure the size distribution of airborne dust and metallic particles in three locations (residential, industrial, and near the pollution source, i.e., steelworks) in Nagoya from Jan. 1972 to March 1972. Dust, lead, iron, copper, and cadmium were measured. Near the pollution source, dust and metallic particle size concentrations peaked at 1-2 micron. The particle size distribution with respect to the total number of a given kind of particle was logarithmic. At the 50% mark, dust particle size near the pollution source was 1.2 micron, and at the industrial and residential locations, 4 micron. For the metals, in the order of pollution source, industrial, and residential locations, the sizes were for Fe 1.4, 3.5, and 3.7 micron, Cu 0.8, 2, and 1.5 micron, Pb 0.6, 1.5, 1.4 micron, and Cd 0.5, 1.4, and 0.6 micron. Health effects on long-time non-smoking residents of the area have been studied by Nagoya City College. Among the 54 subjects, there were clear increases in the amounts of blood lead, fecal lead, fecal coproporphyrin, and fecal delta-aminolevulinic acid. Low-level anemia and anemic tendencies were present in many. Symptoms of slight lead poisoning seemed to be present in three cases.

**40786** **APTIC NO. 64942**

Kawasaki, Gunji, Isao Miyamoto, Akihiro Mizukami,
Yoshihiro Tsuchihara, and Hideichi Okumura

STATE OF ATMOSPHERIC POLLUTION IN TOYAMA PREFECTURE. *(Toyama Ken ni okeru taiki osen jokyo ni tsuite). Text in Japanese. Toyama Kenritsu Otani Gijutsu Tankidaigaku Kenkyu Hokoku (Res. Rep. Toyama Prefect. Otani Junior Coll. Eng.), no. 5:104-111, 1973. 5 refs.*

Amounts of sulfur dioxide gas, dust fall, and suspended particulates were measured. By the lead dioxide method, SO2 was determined. Dust fall was determined by a deposit gauge or dust jar. Suspended particulates were determined by hi-vol sampler. The determination of manganese, calcium, chromium, magnesium, iron, nickel, copper, zinc, cadmium and lead was made by the atomic absorption spectrophotometry. The SO2 content in in Toyama and Takaoka Cities gradually increased from 1966 to 1970 with periodic seasonal changes. The highest content was found in December, 1969, when it exceeded 2.0 mg/100 sq cm/day. The dust fall gradually decreased between 1966 and 1970 in Takaoka, but remained unchanged in Toyama City. The amount of dust fall in 1970 was 10.1 to 21.5 tons/sq km/mo at Toyama, Takaoka, Shinminato, Uozu, and Namerikawa cities and in Daimon, Oshima, and Fukuoka towns. Considerable amounts of Mg, Ca, Cr, Mn, Fe, Ni, Cu, Zn, Cd, and Pb were found in air in Uozu and Namerikawa cities and Iwase, Daimon, Yoshihisa, and Fukuoka. In Kurobe City, only Cu, Zn, Cd, and Pb were detected in air. The presence of Pb in all the areas is attributable to the exhaust gases from automobiles. The average total suspended particulates was 51-222 micrograms/cu m between Sept. 5 and Nov. 6, 1970. The highest content was found in Iwase, where it was so high as 626 micrograms/cu m. The lowest value was found in Fukuoka, where it was 23 micrograms/cu m.

**40787** **APTIC NO. 64909**

Masaru, Kitase and Ito Eiichi

STUDIES ON HEAVY METALS IN ASH OF DUST FALLS. *(Koka baijin kaibunchu jukinzoku seibun ni tsuite--Nagoya-shi ni okeru saikin 10-nenkan no keiko). Text in Japanese. Nagoya-shi Kogai Kenkyushoho (Rep. Environ. Pollut. Res. Inst., City Nagoya), no. 2:7-14, Nov. 1973. 2 refs.*

Spectrochemical analysis and atomic absorption spectrometry were used to analyze year-long samples of ash in dust falls gathered during the period from 1963-1972 in an investigation of heavy metal content and ash trends over the 10 year period for the city of Nagoya. Analytical data are presented for copper, nickel, cadmium, lead, manganese, zinc, iron, and ash. The proportion of heavy metals in ashes was greater at industrial sites, with the overall trend for the period being one of decreasing ash concentrations and changing metal composition.

**40788** **APTIC NO. 63073**

Murchio, Jack C., W. Clark Cooper, and Arturo DeLeon

ASBESTOS FIBERS IN AMBIENT AIR OF CALIFORNIA. *California Univ., Berkeley, School of Public Health, California Air Resources Board Contract PCA 274, Proj. ARB-4-054-1, Rept. EHS-73-2, 97p., March 1, 1973. 20 refs.*

NTIS: PB 226302

Estimates obtained by light and transmission electron microscopy are summarized for the number and size distribution of fibers collected on membrane filters from air in four Los Angeles freeway sites, upwind ambient air controls, and in ambient air from San Francisco Bay Area Cities and other California locations. Chrysotile asbestos fiber concentrations obtained at all locations were in the range of 0-100 fibers/l. Motor vehicles using the Los Angeles freeway system do not appear to be an important source of airborne chrysotile asbestos fibers based on comparison of fiber concentration in various sites upwind and downwind and at various distances from freeways. Amphiboles, glass fibers, and unknowns were also measured and ranged from 0-10, 0-4, and 0-18 fibers/l, respectively.

**40789** **APTIC NO. 63350**

Nagai, Nachiko, Ikuhiro Uchiyama, Yoshitaka Shimada, Yuzure Saito, Kazuo Kaneda, and Ichiro Fukushima

A REPORT OF AN AIR POLLUTION SURVEY USING ALKALINE FILTER PAPER METHOD. *(Arukan roshiho ni yoru taiki osen chosa kekka ni tsuite). Text in Japanese. Gunma-ken Eisei Kenkyu Sho. Gun-maken Kogai Kenkyu Center Nenpo (Annu. Rep. Gunma Inst. Pub. Health Gunma Res. Center Environ. Sci.), no. 5:187-191, 1973. 2 refs.*

An air pollution survey was conducted in Maebashi and Shibukawa areas from May 1972 to February 1973. At 12 measuring points in Maebashi area and 15 measuring points in Shibukawa area, the sulfur oxides, nitric oxide, and chloride ion concentrations were measured by alkaline filter paper. Average daily pollutant concentrations are given. Higher pollutant concentrations found in downtown Maebashi area where no major industries are located are attributed to the higher population density, since the only source of pollution seems to be household consumption of fuels and automobiles. The comparison made by dividing entire Maebashi area into four districts indicates that the pollution on the industrial district is not necessarily the worst. The comparison of monthly average pollutant concentrations in Shibukawas area were higher than those in Maebashi area. This is attributed to the industry in Shibukawa area, since the population density is lower than that of Maebashi. The study on the relationship between air pollution and respiratory diseases does not eliminate the possible effect of pollutants on respiratory diseases.

**40790** **APTIC NO. 61198**

Nakajima, Satoshi

ON THE AIR POLLUTION IN KUSHIRO. *(Kushiro no taiki osen ni tsuite). Text in Japanese. Kushiro Kogyo Koto Senmongakko Kiyo (Repts. Kushiro Tech. Coll.), no. 7:109-115, 1973. 2 refs.*

A statistical analysis was made of the air pollution in Kushiro City. The distribution of sulfur oxides and the local pollution characteristics are deduced from data recorded from April 1964 to March 1970 at 11 stations in the city. There is a clear seasonal trend; sulfur oxides are highest in December and January and lowest in the summer months. The highest monthly average is 0.9 mg SO3/100 sq m/day, and the lowest is 0.2. Mapping of the geographical distribution of sulfur oxides shows that the highest concentration is in the downtown area. A statistically significant correlation was found between values of sulfur oxides at the different measuring stations.

**40791** **APTIC NO. 64908**

Naruse, Youzi, Morihiko Hayakawa, and Toyomasa Kato

THE OXIDANT CONCENTRATION PROFILE IN NAGOYA CITY. *(Nagoya shinai ni okeru okishidanto no doko ni tsuite). Text in Japanese. Nagoya-shi Kogai Kenkyushoho (Rep. Environ. Pollut. Res. Inst., City Nagoya), no. 2:51-54, 1973. 6 refs.*

Oxidant concentrations were measured at five stations in Nagoya to obtain an atmospheric profile for the city. The hourly average maximum concentration was usually above 0.10 ppm for days when winds were from the south or southwest. Peak oxidant concentrations and times of occurrence were also investigated at various monitoring stations.

**40792** **APTIC NO. 64714**

Oshiro, Kiyomasa and Asataka Moriyama

AIR POLLUTION IN OKINAWA. REPORT NO. 1. *(Taiki osen no genkyo (daiippo)). Text in Japanese. Okinawa-ken Kogai Eisei Kenkyusho-ho (Okinawa Prefect. Res. Inst. Pollut. Health), no. 7:33-35, 1973.*

Continuous measurement of nitrogen dioxide, nitric oxide, carbon monoxide, and lead in the air were taken in Naha city, Okinawa between August and October 1973. The predominant wind in August is east to southeast, east in September, and northeast in October, with an average of 5-6 m/sec velocity. The fluctuation pattern of CO was close to that of nitrogen oxides and therefore the source was presumed to be automotive exhausts for both pollutants. The averages for 3 mo ranged between 1 and 1.4 ppm for CO, 0.007 and 0.014 ppm for NO2, and between 0.00 and 0.009 ppm for NO. The maximum 24-hr average for CO was 2.6 ppm and that for 1-hr was 9 ppm; the maximum 24-hr average for NO2 was 0.024 ppm and that for 1-hr was 0.062 ppm; and the maximum 24-hr average for NO was 0.091 ppm and 1-hr was 0.054 ppm. The average for suspended particulates measured by hi-vol sampler was 0.15-0.16 mg/cu m, and the average measured by the light scattering method was 0.13 mg/cu m, and the maximum measurement was 0.23 mg/cu m. Suspended lead level was 0.09-0.18 microgram/cu m in the air and 0.06-0.11% in dusts. The average cadmium level was 0.002-0.01 microgram/cu m in the air and 0.0013-0.0063% in dusts.

**40793** **APTIC NO. 64913**

Popovics, Maria

UP-TO-DATE INTERPRETATION OF URBAN AIR QUALITY DATA. *(Varosi levegominoseg-adatok korszeru ertelmezese). Text in Hungarian. Idojaras (Budapest), 77(6):338-348, 1973. 4 refs.*

Data are presented from sulfur dioxide concentrations measured continuously with a 30 min averaging time from March 1, 1968 to February 28, 1969 over Budapest, Hungary. The data show two maxima for SO2 concentration, with peak values occurring between 6:00-10:30 am and 5:30-10:00 pm. Relative frequencies of SO2 concentrations for the year and the winter half-year are also presented, and the distributions are strongly skewed. Distributions of measured and calculated concentrations are in good agreement. Maximum concentrations of different averaging times are plotted, and the maximum 30 min concentration is 3.2 times the maximum 24 hr concentration which is 6 times the yearly average concentration. The minimum number of 24 hr samples taken daily is also investigated along with different sampling schedules. The best estimation for the maxmum is reached by a modified random schedule. Sample sizes of 123, 61, 52, and 26 are needed for precisions of 10, 16, 18, and 28%.

**40794** **APTIC NO. 61076**

Viala, A., J.-P. Cano, J. Catalin, A. Orieux, J. Achard, and E. Pouget

CERTAIN CHEMICAL AND METEOROLOGIC ASPECTS OF AIR POLLUTION BY SULFUR DIOXIDE AND NITROGEN OXIDES AT THE FOS-L ETANG DE BERRE INDUSTRIAL SITE IN 1972. *(Quelques aspects chimiques et meteorologiques de la pollution atmospherique par le dioxyde de soufre et les oxydes d azote sur le site de Fos-l Etang de Berre en 1972). Text in French. J. Eur. Toxicol., 6(4-5):197- 210, July-Oct. 1973. 13 refs.*

Systematic aerologic measurements of the sulfur dioxide, nitrogen dioxide, and nitric oxide concentrations were conducted at four sites in the Fos-l Etang de Berre industrial area, France, from April through Oct. 1972. The SO2 concentrations in the air were determined by Bodecker s colorimetric method, while the Griess-Saltzman reaction was used for the determination of NO2 and NO. The SO2, NO2, and NO concentrations were relatively low, although there were some peaks. The daily average SO2 concentrations were in a range of 21-57 micrograms/cu m, while the total of the atmospheric NO2 plus NO content ranged from 11 to 22 micrograms/cu m. Simultaneous aerologic measurements revealed good correlation between the SO2, NO2, and NO concentrations and wind speed, wind direction, vertical wind profile, and the vertical thermal profile of the atmosphere in its lower 200-meter layer. Concentration peaks occurred during periods of low wind speeds and temperature inversions. The NO/NO2 ratio, obtained for the four sampling sites, was in a range of 0.36-0.55.

**40795** **APTIC NO. 63280**

Yasuda, Hiroyuki, Yoko Okamoto, and Miwako Yumoto

INVESTIGATION OF AIR POLLUTION IN THE KINKI REGION, WITH AN EMPHASIS ON THE KYOTO-OSAKA-KOBE AREA, BY ALKALINE FILTER PAPER METHOD (REPORT II)--FLUCTUATION OF POLLUTANT COMPOSITIONS BETWEEN 1970 AND 1972. *(Arukari roshiho ni yoru Keihanshin chiku o shu to suru Kinki chiko taiki osen jokyo no chosa (Dainiho)--1970-1972 nen ni okeru osen seibunryo no hendo). Text in Japanese. Mukogawa Joshi Daigaku Kiyo (Bull. Mukogawa Womens Univ.), no. 20-21:15-23, 1972-1973. 4 refs.*

This report is a follow-up study of the previously reported investigation of a large area pollution condition covering the Kinki region, including 30 locations in the Kyoto, Osaka, and Kobe areas. The fluctuations of pollutant levels and compositions were studied by leaving 5 cm by 13 cm potassium carbonate filter papers in screen boxes at 30 places for one month each between November 1970 and October 1972. The monthly recovered papers were analyzed by spectrophotometry for accumulation of sulfur oxides and nitrogen oxides. The measurements expressed by mg/day/100 sq cm are presented in graphs. The sulfur dioxide level shows a general tendency of decrease, probably as a result of the more stringent emission control regulations. The total picture for the nitrogen dioxide level is difficult to grasp, but the monitoring data in the main cities show a tendency of gradual increase. This increase was interpreted as a result of the increase in automobiles. The drastic increase of NOx level in suburbs was interpreted as the result of the sprawling expansion phenomenon of urban areas. The NOx level along express highways shows an alarming rate of increase.

**40796** **APTIC NO. 63407**

Aomori Prefectural Polluton Control Center

THE 1971-1972 AIR POLLUTION MEASUREMENTS. *(Taiki osen sokutei kekka. Showa 46-47 nendo). Text in Japanese. 56p., Nov. 1973.*

The measurements of sulfur oxides, settling particles, suspended particulates, and traffic in Hachinohe city, Aomori Prefecture, and in some cases some other cities and communities in Aomori, for 1971 and 1972 are presented entirely in tables. The 1971 averages of sulfur trioxides measured by lead oxide ranged between 0.16 and 1.60 mg/day 100 sq cm. The 1972 averages ranged between 0.08 and 1.09 mg and showed general improvements. Settling particle records are monthly measurements of total precipitation pH, total dusts, nonsolubles in dusts, tar, ash, total solubles, chlorine, calcium, and sulfuric acid at various locations. The total amount of dusts has decreased considerably between 1971 and 1972. Suspended particulates records show sampling time, suction quantity, dust quantity, benzene extraction, sulfur, nickel, iron, lead, zinc, copper, cadmium, manganese, and chromium in samples. The traffic investigation for 2 years in Hachinohe shows that the average number of cars at each check point ranged between 136 and 254/min, carbon monoxide concentration ranged between 3.5 and 11.3 ppm, sulfur dioxide between 0.010 and 0.071 ppm, nitric oxide between 0.017 and 0.279 ppm, total NOx 0.043 and 0.348 ppm, and dusts 0.4 and 1.8 micrograms/cu m.

**40797** **APTIC NO. 64435**

Tokyo Metropolitan Government (Japan), Ota District

REPORT ON AIR POLLUTION MEASUREMENTS, JANUARY-DECEMBER, 1972. *(Taiki osen sogo sokuteishitsu sokutei kekka hokokusho, Showa 47-nen 1 gatsu - 12 gatsu). Text in Japanese. 75p., 1973.*

The Ota District of Tokyo has 4 monitoring stations that conduct continuous monitoring of the air quality: sulfur dioxide is measured by electroconductivity, oxidant by potassium iodide, nitric oxide and nitrogen dioxide by Saltzman reagent spectrophotometry, carbon monoxide by non-dispersive infrared analyzer, hydrocarbons by the flame ionization detector, and dusts by light scattering. In addition, ultraviolet radiation, wind direction, wind velocity, temperature, and humidity are monitored. The SO2 daily averages in 1972 at the 4 stations ranged between 1 pphm and 5 or 6 pphm (predominantly in the 2-3 pphm range) with one exceptionally high figure of 10.9 pphm in January at one location. The monthly averages ranged between 1.8 and 4.9 pphm. The monthly averages of oxidants at 4 stations ranged between 1 and 4 pphm, with the exception of 6 pphm in one location in October. The monthly averages of NO ranged between 3 and 18 pphm, with extraordinarily high averages of 24 and 25 pphm at one station in November and December. Generally, the winter measurements were much higher than those of other seasons. The monthly averages of CO ranged between 2 and 10 ppm with higher figures in summer. The dust averages were between 60 and 410 mg/cu m. Generally the measurements in winter months tended to be higher. The daily fluctuation patterns of the pollutants and other measurements are presented in graphs.

**40798** **APTIC NO. 64551**

North Atlantic Treaty Organization, Brussels (Belgium), Committee on the Challenges of Modern Society

AIR POLLUTION: APPENDIX B--ASSESSMENT OF AIR QUALITY IN ST. LOUIS, MISSOURI, UNITED STATES. *No. 6, 107p., April 1973. 7 refs.*

An air pollution assessment study made in St. Louis, Mo. is described as part of the Air Pollution Pilot Study of the NATO Committee on the Challenges of Modern Society. The assessment is published as Appendix B to the NATO/CCMS Air Pollution Publication, Guidelines to Assessment of Air Quality (Revised) SOx, TSP, CO, HC, NOx and Oxidants. Emission estimates were made individually for particulate matter, sulfur oxides, carbon monoxide, nitrogen oxides, and hydrocarbons for each of the point sources and collectively for the multitude of area sources. The average concentration of sulfur dioxide ranges from 208 micrograms/cu m for a station in the industrial southern part of St. Louis to 34 micrograms/cu m in suburban portions. The highest 6 mo average for total suspended particulates was 186 micrograms/cu m, and the highest 24 hr value was 1200 micrograms/cu m. For oxidant levels, in 1971, all of the stations considered fall within the range of annual averages of 24 to 31 micrograms/cu m. The average concentrations of CO varied from a high of 5.1 micrograms/cu m in the center of St. Louis to 2.9 micrograms/cu m in the suburbs. The available information on the levels of total hydrocarbons shows a range of average quarterly concentrations of 460 micrograms/cu m to 2750 micrograms/cu m. The average nitrogen oxides levels recorded in the St. Louis area show a range for 1971 of 58 micrograms/cu m to 92 micrograms/cu m.

**40799** **APTIC NO. 64744**

Saga Prefecture (Japan)

THE PRESENT STATE OF PUBLIC NUISANCE AND CONTROL MEASURES IN SAGA PREFECTURE, 1973. *(Kogai no genkyo to taisaku). Text in Japanese. 506p., July 1973.*

In this comprehensive report of various problems and countermeasures in Saga prefecture, one chapter is devoted to the state of air pollution and control measures. The air in the main cities of Saga is monitored for carbon monoxide (2 locations), sulfur oxides (29 lead dioxide cylinders, 4 automatic meters), settling particles (22 deposit gauges), and suspended particulates (4 locations), but no monitoring is conducted as yet for nitrogen oxides and oxidants. In all categories, the environment passes the standard. The measurements of SOx drastically fluctuate between 1 and 2.5 pphm. Settling particles in the prefecture range from 3.1 to 6.4 ton/sq km/month. The measurements of settling particulates in Saga City have been in the range of 4-4.7 tons for 1970-1972; in Karatsu, the measurement decreased from 9 to 4.9 tons; and in the most dusty city in Saga, Imari, the measurement for 3 yrs decreased slightly to 6.47 tons. The carbon monoxide level in the 3 yrs has been 4.7, 6.7, and 6.1 ppm respectively in Saga city. The number of automobiles has tripled in the 7 yrs between 1966 and 1972. Suspended particulates ranged from 0.012 to 0.063 mg/cu m in 1972, with a maximum of 0.92 mg in the Karatsu area.

**40800** **APTIC NO. 64748**

Kawasaki Municipal Government (Japan), Bureau of Public Nuisance

AIR POLLUTION IN KAWASAKI CITY, NO. 11, 1969-1971. *(Kawasaki-shi ni okeru taiki osen). Text in Japanese. no. 11-1969-1971, 231p., March 31, 1973.*

The results of air pollution monitoring in Kawasaki between 1969 and 1971 are presented. The measurements included are: hourly averages, daily averages, frequency of continuous high concentration, and seasonal and daily fluctuations of sulfur oxides, nitrogen oxides, suspended particulates, and oxidants. Sulfur oxides began to decrease in 1968 and a level of 0.05 ppm was maintained in 1970 and 1971. The once heavily polluted Daishi district now shows a decreased level of 0.05 ppm (down from 0.11 ppm). Another heavily polluted area, Tajima, shows a level from 0.08 to 0.06 ppm. Geographical differences are great, but generally the concentration of SOx is higher in the summer. The monthly average of suspended particulates was 1.68 mg/cu m in 1970 winter. The daily average for nitrogen dioxide for 1971 was 0.05-0.06 ppm in all areas, with a maximum of about 0.12-0.17 ppm and a minimum of 0.01 ppm. There were not many geographical differences between districts. The monthly averages of oxidants were 0.03-0.04 ppm for 1971. In each area, the April-May level was 0.04-0.05 ppm and the July-September level was 0.02-0.03 ppm. In the Kawasaki district, the average for December was 0.07 ppm and was extraordinarily high, but the NOx level in this district was also high, at 0.35 ppm.

**40801** **APTIC NO. 64749**

Tokyo Metropolitan Government Adachi District (Japan), Public Nuisance Section

REPORTS ON AIR POLLUTION MEASUREMENTS BY AUTOMATIC ANALYZER/REDUCER (FOR FEB. 1974) NO. 1. *(Taiki osen jido kirokukei sokutei kekka hokoku). Text in Japanese. 311p., March 1973.*

The Adachi district of Tokyo has a large area of extremely congested factories, and on thy other hand a considerable amount of spacious, unused land. At three monitoring locations sulfur dioxide and settling particulates were measured by automatic recorders. Sulfur dioxide was measured by the electroconductivity method and dusts were measured by the light permeation filter method. The level of SO2 for 1971 was 3.6 pphm and for 1972, 3.0 pphm, both within the environmental standard. The frequency of high concentration days was reduced to one half for 1972. For both years, the concentration was lower in fall, with the lowest in September, but other months did not show clear fluctuations. The daily patterns showed the lowest level early in the morning, reaching a peak with a rapid rise between 10 and 11 am, and another peak about 4 pm. The trend was the same for both years, but did not seem to coincide with factory operation hours. The weekly pattern showed a clear low concentration on Sundays and a slight increase in the middle of week. The effects of wind direction on industrial pollutants could not be investigated for lack of data. The dust accumulation level increased in 1971 by 5.9% and in 1972 by 6.6%. The latter measurement reflected a drastic increase of dusts after October.

**40802** **APTIC NO. 64751**

Saitama Prefectural Government (Japan), Dept. of Environmental Protection

REPORT ON THE INVESTIGATION OF AUTOMOTIVE EXHAUST GASES IN THE AIR-1972. *(Taikichu ni okeru jidosha haishutsu gasu chosa kekka ni tsuite--Showa 47 nendo). Text in Japanese. 44p., July 1973.*

Since 1971, the most polluted traffic intersections of Saitama prefecture's major cities have been monitored periodically. Air samples are taken at the intersection itself, 100 m away from the road, and 100 m away from the intersection and the road. The samples are led thr[illegible]es to a non-dispersive infrared gas analyzer installed i[illegible] by building. As a rule, about 480 hr of monitoring is [illegible]cted per month in 20 cities of Saitama. Carbon monoxide, lead, nitrogen dioxide, traffic amount, and weather are monitored. For 1972 studies, the average CO level ranged from 1.6 (Iruma) to 8.1 (Wako) ppm, with the maximum of 30 ppm in Wako. During the measuring periods, the hourly measurement exceeds 30 ppm only once only in Wako, and the 8-hr measurement average exceeded 20 ppm/hr only once in Iruma. The daily average of 1-hr measurement exceeded 10 ppm in four cities a total of six times. The lead content at intersections ranged between 0.11 microgram/cu m to 3.69 microgram/cu m. Nitrogen dioxide measurements daily averages ranged from 0.013 to 0.083 ppm.

**40803** **APTIC NO. 64752**

Saitama Prefectural Environmental Protection Center (Japan)

REPORT ON THE 1971 AIR POLLUTION MEASUREMENTS. *(Taki osen sokutei kekka hokokusho-Showa 46-nendo). Text in Japanese. 427p., Jan. 1973.*

Measurements of sulfur oxides in 1971 were taken at 13 monitoring stations in Saitama. At 12 stations, the effective measuring was over 6000 hr. Of these, two stations failed to pass the environmental standard for SOx. The measurements ranged from 0.018 ppm/hr at Hatogaya to 0.051 ppm at Soka. The trends over the recent three years were an increase for Urawa, Ageo, and Soka, no change in Toda, Tokorozawa, Koshigaya, and Misato, and a decrease in Omiya, Kawaguchi, Hatogaya, Wako, and Uashio. The total fuel oil consumption for 1971 was 1.7 times that of 1967, and the total petroleum fuel 1.9 times greater. But the prefecture as a whole shows a decreasing tendency for the yearly average of per hour measurements for SOx. At four stations, the method of measuring suspended particulates by tape filter paper was changed to the light scattering method. The daily averages throughout the year ranged from 0.02 mg/cu m in Misato to 0.57 mg/cu m in Kawaguchi. The oxidant measurements at six stations were approximately the same (0.24-26 ppm/hr) for 1971. The warnings for more than 0.15 ppm oxidant were most frequently issued in Toda (25) and Kawaguchi (23), but no emergency alert (for 0.5 ppm) was issued during 1971. The highest hourly measurement was 0.3 ppm (Wako) in the summer. The data for nitrogen oxides, carbon monoxide, and total hydrocarbons were limited.

**40804** **APTIC NO. 64753**

Tokyo Metropolitan Government (Japan), Setagaya District

PUBLIC NUISANCE CONTROL MEASURES OF THE SETAGAYA DISTRICT, TOKYO. *(Setagaya no kogai boshi taisaku--kogai o fuseide, sumiyoi kankyo o). Text in Japanese. 82p., Sept. 1973.*

The Setagaya district, Tokyo s characteristic suburban residential area, is polluted by excess traffic on highways, by building and domestic heating systems, and by transported pollutants from the central Tokyo and the Tokyo-Yokohama industrial areas. Pollution by sulfur oxides has been decreasing over the years after a peak in 1967, and recent measurements pass the environmental standard. Pollution is higher in winter due to the domestic heating system, and high pollution in spring and summer comes from the Tokyo-Yokohama industrial area. The level of suspended particulates in this area often exceeds the 24-hr average of 100 microgram/cu m/hr, but particulates from automobile traffic are difficult to control. Carbon monoxide concentration is less than the standard of 10 ppm/hr based on the 24-hr average, but tends to increase in winter, suggesting the effects of the weather. The daily average nitrogen dioxide standard (0.2 ppm/hr) is almost constantly exceeded in this area. The emission source is 53% automobiles; in the winter heating systems also contribute some. In 1972, 1023 persons (751 schoolchildren) were affected by photochemical smogs. Physical damages occurred when the oxidant level exceeded 0.07 ppm.

## 1972

**40805** **APTIC NO. 64583**

Andersen, Ib

RELATIONSHIPS BETWEEN OUTDOOR AND INDOOR AIR POLLUTION. *Atmos. Environ., 6(4):275-278, 1972. 18 refs.*

Paired 24-hr samples of sulfur dioxide and suspended particulate matter were studied outside and inside a room for 7.5 mo to investigate the relationships between indoor and outdoor levels. Indoor concentrations of SO2 and suspended particulate matter were on the average 51 and 69%, respectively of the simultaneous outdoor values, with the coefficients of correlation between the indoor and outdoor values being 0.52 and 0.83, respectively. The reduction in SO2 concentration is presumably due to absorption on the room surfaces and fixtures, while the reduction in suspended particulate matter is presumably due to differences in outdoor and indoor sedimentation-diffusion- and coagulation- processes. (Author abstract modified)

**40806** **APTIC NO. 64822**

Eda, Shizuo

RELATION BETWEEN SULFUR CONCENTRATION IN ATMOSPHERE AND HEAVY METAL POLLUTION IN SOIL. *(Taikichu io sankabutsu to dojuchu jukinzoku osen to no sokan ni tsuite). Text in Japanese. Fukushima Kogyo Koto Senmon Gakko Kiyo (Mem. Fukushima Tech. Coll.), 8(1):83-89, 1972. 11 refs.*

The relationship between sulfur oxides in the atmosphere and heavy metals in the soil was investigated by measuring SOx concentrations at 17 points in an urban area. Maximum SOx concentrations were found in the neighborhood of two factories emitting large amounts of stack gases. The relationship of SOx concentration to distance closely resembles that of heavy metal concentration to distance, with the maximum point of the latter at a distance of 3-4 km from the source being about 1 km closer to the source. Mean settling velocity of heavy metal particles was calculated at 0.1-0.3 m/sec, while particle diameter was calculated at 20-50 micron.

## 1971

**40807** **APTIC NO. 60576**

Koerner, H.-J.

DUST FALL MEASUREMENTS IN THE LOWER MAIN REGION. *(Staubniederschlagsmessungen in der Region Untermain). Text in German. Regionale Planungsgemeinschaft Untermain, Frankfurt am Main (West Germany). Lufthyg.-Meteorol. Modelluntersuch. Reg. Untermain, 4th, Frankfurt am Main, West Germany, 1971, p. 46-49. (Nov. 4-5.)*

Results of dust fall measurements, performed by means of Bergerhoff instruments in the Lower Main region in 1970 within the framework of an air hygienic and meteorologic model study of that region are presented. Bergerhoff instruments, delivering 30-day values, were set up in every sq km unit of the survey area of 105 sq km. The yearly averages of the dust fall, as measured at the different sampling sites, varied from 0.18 to 1.08 g/sq m/day, while the monthly averages were in a range of 0.29-2.37 g/sq m day, both in the Frankfurt-Offenbach area. The corresponding yearly and monthly averages in the Hanau-Grosskrotzenburg area were in the respective ranges of 0.13-0.30 g/sq m/day and 0.24-0.71 g/sq m/day. The monthly and yearly averages exceeded the maximum allowable levels of 0.65 g/sq m/day and 0.42 g/sq m/day as established for nonindustrial areas in 28.6% and 11.4% of the area units. The corresponding percentages for industrial areas for which the maximum allowable monthly and yearly dust fall is limited to 1.30 g/sq m/day and 0.85 g/sq m/day were found to be 4.8% and 1.9%.

**40808** **APTIC NO. 64903**

Saitama Prefecture,(Japan)), Dept. of Environmental Protection

REPORT ON THE 1970 INVESTIGATION OF AIR POLLUTION--SULFUR OXIDES AND SUSPENDED PARTICULATES. *(Taiki osen chosa hokokusho-io sankabutsu, fuyu baijin o chushin to shite). Text in Japanese. 246p., March 1971.*

In 1970 continuous monitoring of air polution in Saitama Prefecture was achieved by 13 automatic recorders, 8 anemometers, 14 sulfur oxide meters (lead dioxide method), 14 settling particle meters, 4 oxidant meters, 4 total hydrocarbon meters, 4 nitrogen oxide meters, 4 ultraviolet meters, 3 carbon monoxide meters, and 1 digital dust counter. A good portion of this equipment was newly purchased in 1970. Of the 13 monitoring stations, seven were able to obtain more than 7000 hrs/year of continuous monitoring in 1970. Among the stations that failed to pass the environmental standards in 1969, two failed again. One of them, Hatogaya City Hall, failed to pass in all categories of standards. The amount of settling particulates decreased in some cities, but the level in the prefecture as a whole increased. The 1970 averages in cities ranged between 8 tons/sq km/mo to 16.6 tons/sq km/mo. The most polluted area was Kawaguchi. The year s total average for SOx ranged from 0.012 ppm in Kamio to 0.063 ppm in Hatogaya, with a maximum range of 0.16 ppm to 0.36 ppm.

## 1970

**40809** **APTIC NO. 63112**

Rodgers, Sheridan J., Ferdinand Roehlich, Jr., and Cataldo A. Palladino

TUNNEL VENTILATION AND AIR POLLUTION TREATMENT (FINAL REPORT). *Mine Safety Appliance Research Corp., Evans City, Pa., Dept. of Transportation Contract FH-11-7597, FHWA-RD-72-15, Work Unit FCP 33F3012, Ab 2980, MSAR-71-187, 266p., June 30, 1970. 470 refs.*

NTIS: PB-210 360

Current air quality in existing tunnels was evaluated and methods to upgrade air quality in existing and future tunnels were determined. Only carbon monoxide, hydrocarbons, nitrogen oxides, and particulates pose any significant problems. Tentative limits for safety for unmanned tunnels include: CO, 500 ppm; nitric oxide, 37.5 ppm; nitrogen dioxide, 5 ppm; and particulates, 10 mg/cu m. A computer program was developed and validated to predict various significant air contaminants. Instrumentation to monitor tunnel air quality was proposed. Treatments of tunnel air for either discharge to the surroundings or recycling were examined. Economic and processing constraints such as dilute concentrations were probed. Limited laboratory tests were conducted: removal of CO appears impractical; adsorption of NO2 and more noxious hydrocarbons by activated carbon shows promise; particulates can be largely removed by electrostatic precipitation, filtration, and wet scrubbing. (Author abstract modified)

**40810** **APTIC NO. 64533**

Conference Board, Inc., New York

CORPORATE ORGANIZATION FOR POLLUTION CONTROL. *Rept. 507, 78p., 1970.*

The corporate organization and control plans of 89 companies in 12 industrial classifications in the U. S. and Canada were studied dealing with the problems of abating air and water pollution. The structure of the corporate pollution control unit, the responsibilities of the executive in charge, his background, his place in the corporate organization, and his role in the formulation and implementation of policy are reviewed. The broadening of pollution control functions to include related areas such as noise abatement and beautification is discussed. Ten case studies of corporate approaches to pollution control are reviewed, and examples of position descriptions and organizatio charts are given. (Author abstract modified)

# ATMOSPHERIC INTERACTION

## 1974

**40811** **APTIC NO. 63329**

Anfossi, P., D. Bacci, and A. Longhetto

AN APPLICATION OF LIDAR TECHNIQUE TO THE STUDY OF THE NOCTURNAL RADIATION INVERSION. *Atmos. Environ., 8(6):537-541, June 1974. 6 refs.*

Two field experiments were carried out near a power plant using lidar to make 500 backscattered echoes. Lidar was able to provide reliable information on the development of the depth of the nocturnal radiation inversion. An increase of the height of the inversion top correlated well with time after sunset, independent of the season of the year, implying a rate of vertical exchange consistent with a thermal diffusion coefficient of about 3000 sq cm/sec. The lidar sounding results agreed fully with the temperature measurements, and they fit well with the Taylor theory. The temperature inversion formed after sunset if the wind speed at 120 m was less than about 7 m/sec; the maximum height of the inversion top was 270 m. The eddy thermal diffusion coefficient showed no significant correlation with wind speed, if less than the threshold value. (Author abstract modified)

**40812** **APTIC NO. 63225**

Barber, F. R., A. Martin, J. G. Shepherd, and G. Spurr

THE PERSISTENCE OF PLUMES FROM NATURAL DRAUGHT COOLING TOWERS. *Atmos. Environ., 8(4):407-418, 437, April 1974. 14 refs. (Presented at the Symposium on Environmental Effects of Cooling Towers, Surrey, England, March 27-28, 1973, Paper 11.)*

The analysis of thrice daily observations of a power plant cooling tower plume lengths and meteorological conditions, continued through a full year, shows that plumes are predominantly short in the summer, and often persistent only in the winter. Relative humidity is an important factor in determining plume length, and may be used to predict monthly distributions of plume length with good accuracy, or to categorize plumes as short, medium, or persistent correctly on three occassions out of four. Mingling of plumes from adjacent towers causes a considerable increase in overall plume lengths. The simple geometrical model of plume dispersion originated by Baker to underestimates long plumes. It has therefore been modified to cover the case where plumes mingle, and to take some account of the effect of stability on dispersion rates. The resulting formula for plume lengths uses little empirical information, but is only able to predict plume lengths to within a random factor of about 3. It may be used to categorize individual plume lengths with about the same accuracy as a simple empirical relationship based on relative humidity, but may be somewhat less specific to the station concerned. A useful description of the behavior of cooling tower plume lengths has therefore been obtained for the particular site studied. Since the results have not yet been tested at other sites, they should therefore only be applied to any other station or other site with caution. (Author conclusions)

**40813** **APTIC NO. 63188**

Bartels, H. J., W. Caspar, and H. Scharrer

METEOROLOGICAL MEASUREMENTS. *In: Air Hygienic Meteorological Model Studies of the Lower Main Region. Report 5. Regional Planning Assoc., Lower Main Region, Frankfurt am Main (West Germany), p. 128-180, June 1974. 3 refs.*

For determination of the meteorological conditions in the study area Lower Main continuous measurements of the air temperature, relative humidity, wind direction, and wind speed were taken at 48 temporary measuring stations, four climate-, 3 synoptic, and 25 precipitation measuring stations of the West German Weather Bureau. At the observation stations of the West German Weather Bureau the atmospheric pressure, cloud coverage, visibility, and duration of sunshine were measured. Special mobile equipment, installed on a so-called profile survey car and a mini-aerological measuring vehicle were used to carry out short-time measurements under certain weather conditions for one or two days. The profile survey car was used to determine the horizontal distribution of air temperature, humidity, and wind along a determined topographical profile or between city and open countryside. The mini-aerological measuring vehicle was used for the measurement of local wind systems and vertical distribution of temperature, especially inversions. A detailed description of the results of the meteorological measurements is given along with numerous graphs and maps.

**40814** **APTIC NO. 63387**

Beresin, V. M., N. F. Elansky and A. R. Nasyrov

DETERMINATION OF ATMOSPHERIC OZONE TOTAL CONTENTS CONSIDERING MULTIPLE SCATTERING. *(Uchet mnogokratnogo rasseyaniya pri opredelenii obshchego soderzhaniya ozonz v atmosfere so sputnika). Text in Russian. Izv. Akad. Nauk SSSR, Fiz. Atmosfery i Okeana, 10(4):370-378, 1974. 10 refs.*

The two-layer plane-parallel model of the Earth s atmosphere is considered. The ratiation leaving the atmosphere is presented in form of the sum of the lower tropospheric layer diffusively reflected solar radiation and the upper layer primary scattered solar radiation. The dependence derived between the departing ultraviolet radiation intensity and the atmosphere ozone amount is used for the calculation of the total ozone content. The scheme of a numerical computation is described. The results of the calculation are used for obtaining the horizontal distribution of total ozone over North America.

**40815** **APTIC NO. 63376**

Bortner, M. H., R. H. Kummler, and L. S. Jaffe

CARBON MONOXIDE IN THE EARTH S ATMOSPHERE. *Water, Air, Soil Pollut., 3(1):17-52, March 1974. 92 refs.*

Although carbon monoxide is continually introduced into the Earth s atmosphere as a pollutant, there are some mechanisms operating which destroy most of the CO, for example, a CO sink. These mechanisms have not as yet been established in a quantitative sense. The various possible removal mechanisms which warrant serious consideration are discussed. Particular emphasis is given to chemical reactions (especially with hydroxyl radical), soil bacteria and other biological action, and transport effects. The sources of CO, both natural and anthropogenic, are reviewed, and it is noted that there is quite possibly a significant undefined natural source. Atmospheric CO concentrations are discussed, and their implications to lifetime sinks, and sources are considered. Global distribution of CO as a function of latitude, CO concentrations in rural and urban areas, and CO concentrations in surface water and the atmosphere as a function of the time of day/are reviewed. Potential CO sinks discussed include vertical transport to and reaction in the stratosphere, ground level and tropospheric chemistry, biological sink activity in the soil and ocean, and horizontal transport. (Author abstract modified)

**40816** **APTIC NO. 62958**

Calder, Kenneth L.

MISCELLANEOUS QUESTIONS RELATING TO THE USE OF AIR QUALITY SIMULATION MODELS - RECAPITULATIONS AND ET CETERAS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Meteorology Lab., 21p., 1974 (?). 5 refs. (Presented at the North Atlantic Treaty Organization Committee on the Challenges of Modern Society, Meeting of the Expert Panel on Air Pollution Modeling, 5th.)*

Some critical questions relating to the use of air quality simulation models are discussed. The simplest form of air quality simulation for air quality management is the proportional or rollback method which has several drawbacks. Therefore the Air Quality Simulation Model (AQSM) was developed to estimate the relative magnitudes of the concentration contributions from different sources. An example is given of a model for atmospheric dispersion of a plume. The concentrations from a steady continuous emission vary directly as the source strength; concentrations vary approximately inversely as the mean wind speed; and the average height and width of a cloud vary little with wind speed. The model is similar to Pasquill s diffusion model which has been the basis for Gaussian plume models. The AQSMs provide high decision value and can be used in comprehensive verification studies. The modular structure of AQSMs and their validation are discussed. There is a need for critical examination of the precise requirements for air quality inputs in a systems approach. Limitations of AQSMs must be recognized when they are used. The overall AQSM is a composite of many elements or sub-models, such as those for the spatio-temporal distribution of emissions, for atmospheric transport and dispersion, and for physical and chemical transformation and removal processes. The individual elements must be evaluated to determine the sensitivity of the AQSM output to variations of the inputs and possible errors in the various sub-models.

**40817** **APTIC NO. 63189**

Fortak, H.

MODEL FOR THE DETERMINATION OF AIR QUALITY. *In: Air Hygienic Meteorological Model Studies of the Lower Main Region. Report 5. Regional Planning Assoc., Lower Main Region, Frankfurt am Main (West Germany), p. 181-217, June 1974. 5 refs.*

The mathematical-meteorological multi-source diffusion model based on the emission inventories and on the statistics of meteorological dispersion conditions was used for determining the air quality of the Lower Main region. Meteorological results indicate that, except under conditions of calm weather, the windfield in the Lower Main area is homogeneous and runs parallel to the Taunus for the major part of the year, which justifies the application of the model to the Lower Main region in most weather conditions. A complete description of the individual calculation steps of the model is given in the form of a flow diagram. In six maps the calculated average sulfur dioxide emission concentrations as well as the I2 values (according to Stratmann) for the entire year, the winter, and the summer season are presented. The emission climatologies of selected stations are shown in the form of sum frequency distributions. The illustrations compare the measured sum frequencies with the calculated ones for three stations. For the central station and the station in the PTT building the share of high concentrations has been over-estimated. A much better agreement was found for the Ackermann school station. Measurements were carried out at these three stations only during the period for which meteorological data were available. The reason for over-estimating the share of high concentrations is not yet known. No estimate can be made as to what extent and in what sense the 29% of calm weather conditions, topographic effects, or heat island effects have influenced this result. An improvement of all the results on all stations can very likely be achieved by calibration of the model, which has not yet been carried out. This will be possible as soon as measured sum frequencies are available for the remaining stations, for which, to date, only the calculated sum frequencies exist.

**40818** **APTIC NO. 63328**

Hameed, S.

MODELLING URBAN AIR POLLUTION. *Atmos. Environ., 8(6):555-561, June 1974. 10 refs.*

The performance of simple, one parameter models for predicting dispersion of air pollutants in urban atmospheres is compared with that of more sophisticated methods. Presently available simple models are not dependable enough to preclude the development of more complex models. The models are used to predict the dispersion of sulfur dioxide during a period of 2 hr on Jan. 11, 1959 in the air above Nashville, Tenn. Most models of urban air pollution produce concentrations with errors, on the average, of the order of a factor of two because of poor data and unperfected dispersion models. Since sophisticated models can be depended upon to predict pollution concentrations to within a factor or two, it is apparent that simple models cannot be relied upon to give results which are always correct to within a given margin of error. (Author abstract modified)

**40819** **APTIC NO. 62950**

Huntzicker, J. J., S. K. Friedlander, and C. I. Davidson

ENVIRONMENTAL PATHWAYS FOR AUTOMOBILE EMITTED LEAD. LEAD FROM AUTOMOBILE EXHAUST IS TRACED THROUGH THE LOS ANGELES ENVIRONMENT. *Preprint, California Inst. of Tech., Pasadena, Environmental Engineering Science, 31p., 1974. 44 refs.*

Each day 18 tons of lead are exhausted into the Los Angeles atmosphere by the combustion of leaded gasoline. To understand the implications of this, the environmental pathways for lead are reviewed. Size and concentration of particulate lead depends on the driving mode. Approximately 17.8 + or -

2.6 tons/day lead are exhausted to the atmosphere in the Los Angeles/Orange County area; 17.2 tons/day of this are particles and the rest is in the vapor phase, presumably as tetraethyl lead. Some lead is deposited, depending on particle size. Lead particles on or near roads are those greater than 9 micron in diameter. At 30 m from highways, lead is a factor of 15 less than at the highway edge. Results are presented for lead measurements at various distances from highways, in the air in Los Angeles, and in oats. Lead and carbon monoxide in the air are also removed by wind. In measurements in the Los Angeles Basin for 1969 and 1970, the Pb/CO ratio was 0.59 + or - 0.18 micrograms/cu m. Approximately 9800 tons CO are emitted each day in the Los Angeles area. Lead deposition was measured at four sites along the coast and on Santa Catalina Island and San Clemente Island during the summer of 1973. The water surface behaved similarly to the dry surface with respect to particle collection. Deposition values were plotted as a function of distance from the cost, and diffusion of lead to Santa Catalina and Pasadena were measured. Lead input to coastal waters from rainfall was 1.7 tons/day from 1968 to 1973. Runoff and sewage are also sources of lead in coastal water. Lead deposition was measured in remote areas around Los Angeles to determine the transport of wind blown lead. Of the 17.8 tons/day lead exhausted into the Los Angeles area from automobiles, 2/3 is deposited within the basin and 1/3 is blown out of the basin. Most of the lead is deposited on the land and immobilized in the soil, but some street dirt can be washed into the storm sewers and ultimately into the coastal water during the rainy season. Wet and dry season runoff, dry weather deposition, and rainout-washout account for 50% of the input into coastal waters. The remaining airborne lead is primarily in submicron particles which can be transported into remote areas adjoining Los Angeles.

**40820** **APTIC NO. 64848**

Hawke, G. S. and D. Iverach

A STUDY OF HIGH PHOTOCHEMICAL POLLUTION DAYS IN SYDNEY, N.S.W. *Atmos Environ., 8(6):597-608, June 1974. 13 refs.*

The conditions required for the formation of photochemical oxidants are reviewed in relation to Sydney s growing problem in this area. The location of the high source areas for the oxidant precursors, hydrocarbons and oxides of nitrogen, are identified, and the transport of the air masses above them to Lidcombe, where the oxidant levels were measured are discussed. The meteorological conditions existing on representative high ozone days are examined. Anticyclones dominated 70% of such days, while weak synoptic pressure gradients occurred on the others. When high O3 concentrations were measured at Lidcombe, Sydney was under the influence of high pressure cells, and the geostrophic wind speeds were less than 6 m/sec. The resulting stable conditions limited the vertical mixing and the horizontal dispersion of air pollutants. Associated cloud cover was such that there was a nocturnal radiative inversion of 5-10 C in the lower few hundred meters on these days until approximately 11 am and adequate solar radiation to allow the photochemical reactions to proceed during the day. A light westerly drainage wind flowed until about 11 am when it became calm until the easterly sea breeze moved inland. The sea breeze did not always have a highly cleansing action, for on some days high ozone concentrations were recorded for up to 3 hr after the sea breeze front passed. Under such meteorological conditions, the advection of air masses from the percursor source areas to Lidcombe were responsible for the high concentrations recorded. (Author abstract modified)

**40821** **APTIC NO. 63326**

Johnston, Harold S.

PHOTOCHEMISTRY IN THE STRATOSPHERE--WITH APPLICATIONS TO SUPERSONIC TRANSPORTS. *Acta Astronaut., 1(1-2):135-156, Jan.-Feb. 1974. 41 refs.*

Photochemical reactions in the troposphere and stratosphere are discussed. Natural atmospheric ozone is the only effective shield of the surface against solar radiation between 300 and 250 nm. The ultraviolet damage to skin (sunburn, skin aging, skin cancer), to the eyes (snow blindness), and to plants (inhibition of photosynthesis, stunted growth, death) is brought about by the small amount of solar radiation near 300 nm that now reaches the surface of the earth. Some biologists state that a systematic 5% reduction of O3 would have serious biological consequences. The amount of combustion in the troposphere is increasing. Nitrogen dioxide and nitric acid are so rapidly washed out by rain that the ambient mole fraction of nitrogen oxides in the middle or upper troposphere is only 1-3 ppb. The mole fraction of NOx is higher than this in the stratosphere. The gradient of NOx is from the stratosphere toward the ground. Random diffusion processes transport NOx down, not up. A bodily mixing of tropospheric air with stratospheric air would reduce the mole fraction of NOx in the stratosphere.

**40822** **APTIC NO. 64833**

Kacharskaya, L. V.

MODEL OF THE TURBULENT DIFFUSION OF AEROSOLS. *(Model turbulentnoy diffuzii aerozoley). Text in Russian. Inzh.-fiz. Zh., 26(3): 457-461, March 1974. 8 refs.*

A model is proposed for turbulent diffusion of aerosols in the atmosphere with Sutton s model taken as a basis for the Lagrangian correlation function of cloud particle velocity. Sutton s correlation function was applicable for shorter times than the Lagrangian scale of turbulence. A formula for the determination of generalized turbulent viscosity is presented. The magnitude of generalized turbulent viscosity was decreased with altitudes within the lower 250 m range.

**40823** **APTIC NO. 63282**

Likens, Gene E. and F. Herbert Bormann

ACID RAIN: A SERIOUS REGIONAL ENVIRONMENTAL PROBLEM. *Science, 184(4142):1176-1179, June 14, 1974. 37 refs.*

The effects of acid rain or snow which is falling on most of the northeastern United States are discussed. The annual acidity value averages about pH 4, but values between pH 2.1 and 5 were recorded for individual storms. The acidity of precipitation in this region increased about 20 yr ago, and the increase may be associated with the augmented use of natural gas and with the installation of particle removal devices in tall smokestacks. Injected at heights of 60-360 m, the sulfur dioxide may be dispersed over wide areas, and in the absence of equivalent amounts of alkaline substances in the atmosphere, appreciable quantities of SO2 are converted to acid. There is a long range dispersion of both pollutants. Effects of acidity include changes in the leaching rates of nutrients from plant foliage, changes in the leaching rates of soil nutrients, acidity of lakes, metabolism of organisms, and corrosion. An estimate of total anthropogenic emissions for the United States indicates that 32 times 10 to the 6th power metric tons of sulfur oxides are annually injected into the atmosphere. This amount will increase two to fivefold by 2000. (Author abstract modified)

**40824** **APTIC NO. 63228**

Martin, A.

THE INFLUENCE OF A POWER STATION ON CLIMATE-A STUDY OF LOCAL WEATHER RECORDS. *Atmos. Environ., 8(4):419-424, 437, April 1974. 14 refs. (Presented at the Symposium on Environmental Effects of Cooling Towers, Surrey, England, March 27-28, 1973, Paper 12.)*

Local weather records collected near a 2000 MW power station with eight natural-draught cooling towers have been examined to see if any climatic effects due to the power station could be detected, for the four years of its operation so far. The emissions from the station have not affected the values of total rainfall, hours of bright sunshine, or incidence of morning fog recorded by climatological stations at distances of 4 km (the nearest station) and above from the station. The reduction in the incidence of fog in the area over the years is related to the reduction in domestic smoke concentrations. The low frequency of fogs in a country district is not affected by variations in smoke concentrations around 60 micrograms/cu m per season. Smoke concentrations above 170 micrograms/cu m per season in a town lead to an increase in the number of fogs, in direct correlation with the smoke concentrations. Sulfur dioxide concentrations have no discernible effect on the incidence of fog. (Author abstract modified)

**40825** **APTIC NO. 64884**

Molina, Mario J. and F. S. Rowland

STRATOSPHERIC SINK FOR CHLOROFLUOROMETHANES: CHLORINE ATOMIC-ATALYSED DESTRUCTION OF OZONE. *Nature (London), 249(5460):810-812, June 28, 1974. 31 refs.*

Chlorofluoromethanes are being added to the environment in steadily increasing amounts. These compounds are chemically inert and may remain in the atmosphere for 40-150 years, and concentrations are expected to reach 10-30 times present levels. Photodissociation of the chlorofluoromethanes in the stratosphere produces significant amounts of chlorine atoms and leads to the destruction of atmospheric ozones. Dichlorodifluoromethane and trichlorofluoromethane have been detected throughout the troposphere in amounts of about 10 and 6 parts per 10 to the 11th power by volume, respectively. The most important sink for these compounds seems to be stratospheric dissociation. Both CFCl3 and CF2Cl2 absorb radiation in the far ultraviolet, and stratospheric photolysis will occur mainly in the windown at 1750-2200 A. Measurements of absorption coefficients for the chlorofluoromethanes were extended to cover the range 2000-2270 A, and calculations of the rate of photolysis of molecules were made at different altitudes. The photodissociation rates at an altitude of 30 km were 3 times 10 to the -7th power/sec for CFCl3 and 3 times 10 to the -8th power/sec for CF2Cl2. If the stratospheric photolytic sink was the only major sink for CFCl3 and CF2Cl2, then the 1972 production rates corresponded at steady state to globally averaged destruction rates of about 0.8 times 10 to the 7th power and 1.5 times 10 to the 7th power molecules/sq cm/sec and formation rates of chlorine atoms of about 2 times 10 to the 7th power and 3 times 10 to the 7th power atoms/sq cm/sec, respectively. Photolysis of these chlorofluoromethanes does not occur in the troposphere because the molecules are transparent to wavelengths longer than 2900 A. In fact, the measured absorption coefficients for CFCl3 and CF2Cl2 fall rapidly at wavelengths longer than 2000 A. The reaction between hydroxyl and methane is important in the troposphere, but the corresponding Cl atom abstraction reaction is highly endothermic and is negligible under all atmospheric conditions. Neither CFCl3 nor CF2Cl2 are very soluble in water, and they are not removed by rainout in the troposphere.

**40826** **APTIC NO. 63222**

Moore, D. J.

THE PREDICTION OF THE RISE OF COOLING TOWER PLUMES. *Atmos. Environ., 8(4):403-406, 437, April 1974. 14 refs. (Presented at the Symposium on Environmental Effects of Cooling Towers, Surrey, England, March 27-28, 1973, Paper 10.)*

An expression developed from the chimney plume trajectory equation gives a good representation of some limited experimental data on cooling tower plumes at Eggborough. The heat emission term is taken as that from a single tower. Account is also taken of the relatively small temperature difference between the effluent and the ambient air and the low efflux velocity. The concentration of water vapor and the temperature excess within these plumes could be calculated as described elsewhere. Such calculations should be an improvement on the method for predicting the lengths of cooling tower plumes. Further work should also include a more comprehensive comparison of observed and calculated cooling tower plume heights, preferably including lidar results. Interaction between the plumes from adjacent towers and other effects which could alter the sensible heat content of the plumes do not seem to have been important in determining the rise in this investigation. (Author abstract modified)

**40827** **APTIC NO. 64486**

Nakai, Nobuyuki and Ushio Takeuchi

CHEMISTRY OF RAIN AND AIR POLLUTION. *(Ame no kagaku to taiki osen) Kagaku (Science), 29(6):418-426, June 1974.*

Rain and snow contain various airborne ions and metals in different concentrations. Average concentrations of sulfate ion and chloride ion in rain at Kichijoji area in Tokyo from 1967 to 1973 were 4.8 ppm and 0.9 ppm, respectively. The highest monthly average concentration of sulfate ion was 6.0 ppm in February while that of chloride ion was 1.9 ppm in December. The sulfur isotope (S-34) content in sulfate ion in rain was measured in industrial and residential areas. The average values for residential areas were considerably higher than those in industrial areas, more than 15% compared to about 7% in 1960. The low S-34 content in rain indicates that the sulfate ions do not entirely result from sea water whose sulfate ion contains more than 20% of S-34. Forty to 50% of the sulfate ions in rain resulted from air pollution by sulfur oxides in 1960 in large cities; the contribution by the SOx pollution increased to 75% in 1973.

**40828** **APTIC NO. 63194**

Padmanabhamurty, B. and M. S. Hirt

THE TORONTO HEAT ISLAND AND POLLUTION DISTRIBUTION. *Water, Air, Soil Pollut., 3(1):81-89, March 1974. 15 refs.*

A study of the lapse rate or stability at the Meteorological Research Station at Woodbridge (a rural area) and its relation to heat island intensity in Toronto (an urban area) was made. For clear and partly cloudy conditions with off-land winds, the heat island intensity was related to lapse rate/stability (x) as equal to 3.81 + 0.88x. Further, concentration of particulate pollutants was related to lapse rate/stability in the form mean particulate pollutant concentration in the urban built-up area equals 0.53 - 0.13X + 0.005 (X squared), where X equals 1000 times ((T2-T1)/U) to the 1/2 power, where T1 and T2 are temperatures at two different levels on the meteorological tower, and U is the mean wind speed at 10 m. (Author abstract)

**40829** **APTIC NO. 62896**

Ruff, Donald E. and Douglas G. Fox

EVOLUTION OF AIR QUALITY MODELS THROUGH THE USE OF THE RAPS DATA BASE. *Environmental Protection Agency, Research Triangle Park, N. C., Data Management Unit an/d Environmental Protection Agency, Research Triangle Park, N. C., Model Development Branch, Rept. 74-124, 24p., 1974 (?). 13 refs.*

The current status of the Environmental Protection Agency s Regional Air Pollution Study (RAPS) is reviewed. The study will be undertaken in St. Louis area, where carbon monoxide, methane, total hydrocarbons, gaseous sulfur, ozone, nitrous oxide, nitrogen dioxide, particulates, wind speed and direction, ambient temperature, dew point temperature, and other meteorological factors will be monitored. The development of a large data base, the methodology used for collecting and assessing this data, and the elements of the data base are described. Examples of the use of currently available data bases for the development and validation of air quality simulation models are presented. Complex model development is warranted to improve air quality model performance. In order to improve the usefulness of these complex models, the emissions inventory and the meteorological information presented to them must be improved. (Author abstract modified)

**40830** **APTIC NO. 63372**

Schlesinger, William H., William A. Reiners, and David S. Knopman

HEAVY METAL CONCENTRATION AND DEPOSITION IN BULK PRECIPITATION IN MONTANE ECOSYSTEMS OF NEW HAMPSHIRE, USA. *Environ. Pollut., 6(1):39-47, Jan. 1974. 39 refs.*

Concentrations of lead, mercury, and cadmium in bulk precipitation were measured at four heights along an 886 m elevational gradient in New England during four months of 1971. The weighted average concentration of lead, determined by atomic absorption spectrophotometry, was 13.4 micrograms/l. The mean deposition rate was 54 micrograms/sq m/day, and an extrapolated value for mean annual deposition was 20 mg/sq m, 18 times higher than that reported in marine air in the mountains of California, but lower than that reported in urban areas where heavy metals are released in high concentrations by human activities. These values suggest that New England receives a relatively high deposition of lead due to its continental downwind position. Much of this lead probably originates from human activities. Cadmium and mercury concentrations averaged 0.6 and 0.06 micrograms/l, respectively, and deposition rates averaged 2.4 and 0.2 micrograms/sq m/day, respectively. It is probable that these bulk precipitation measurements underestimate the total deposition at high elevations since they do not account for cloud water condensation and aerosol impaction. (Author abstract)

**40831** **APTIC NO. 63223**

Spurr, G.

METEOROLOGY AND COOLING TOWER OPERATION. *Atmos. Environ., 8(4):321-324, 437, April 1974. 14 refs. (Presented at the Symposium on Environmental Effects of Cooling Towers, Surrey, England, March 27-28, 1973, Paper 3.)*

Because of its wide experience in the use of natural draught cooling towers, the Central Electricity Generating Board occupies a unique position in a discussion of environmental effects. A number of paper s have been produced in other countries on climatic effects, claiming for example that the incidence of ground-level fog would be increased, and that precipitation from the plume would become a hazard, particularly in freezing conditions. Where salt water was used, the countryside would be seriously affected. The climatic aspects have been studied at several of the many cooling tower stations in England and provided natural draught towers are designed properly and well maintained, the impact of their operation has a negligible effect on the local climate. A salt water tower station has also operated for many years with negligible effects. A persistent elevated plume, which occurs under conditions of high ambient relative humidity and aggravates the adverse visual impact of the large bulk of the cooling towers themselves, is the most objectionable atmospheric feature. (Author abstract)

**40832** **APTIC NO. 64871**

Tsuchiya, Iwao

HEAT POLLUTION OF URBAN AIR AND ITS EFFECTS. *(Toshi taiki no netsu osen to sono eikyo). Text in Japanese. Kankyo Kenkyu (Environ. Studies), no. 6:33-41, May 1974. 7 refs.*

When the atmosphere in large urban areas is heated and forms local heated air masses, it can cause unexpected phenomena. One instance is the rise of the average temperature of Tokyo, which moved up from 21-30 C in August 1881-90 to 25-33 C in August 1961-70. The present temperature range is similar to that of North Africa. One major cause of deterioration of urban meteorology is the increase of artificial heating. Any artificial heat generation is accompanied by some sort of pollutant. Smog incidents are concentrated in the hilly residential areas of Tokyo. Usually this phenomenon is explained by the meeting of land and sea breezes and the formation of a sea breeze front in the residential area. In order to discover why smog does not form a linear pattern along the front line, the effects of thermal distribution were measured by infrared photography from an airplane. The thermal map showed a temperature difference of as much as over 20 C, which would naturally create a strong upcurrent. The upcurrent of a polluted area cannot go through a strong inversion layer in the upper sky and instead spreads horizontally. But if there is a low temperature zone underneath, the polluted air will descend again. Thus, polluted air begins to circulate between the ground and the inversion layer above. In a large heat concentration area like a schoolyard, the high concentration pollution air mass passage is quite frequent, and if there is toxic industrial flue gas in the direction of wind, the danger is doubled. A stratified wind tunnel experiment of thermal

**40833** **APTIC NO. 64823**

Wakamatsu, Shinji, Yoshio Saiki, Yasujii Himi, and Saburo Kanno

VERTICAL DISTRIBUTION OF AIR POLLUTANTS IN KANAGAWA PREFECTURE. *(Kanagawa-ken ni okeru kodobetsu taiki osen bunpu chosa). Text in Japanese. Kanagawa-ken Kogai Senta Nenpo (Annu. Rep., Kanagawa Prefect. Environ. Cent.), no. 5:43-55, Feb. 1974. 2 refs.*

Observations using a helicopter and pilot balloon were performed in Kanagawa Prefecture at heights up to 1 km for the purpose of obtaining vertical wind profiles, ozone concentration distribution, and temperature distribution in the planetary boundary layer. The data were analyzed in relation to ground level concentration of air pollutants and meteorological elements. Ozone concentration is apt to increase under sea breeze conditions. Ozone concentration increases with height when the effect of the sea breeze is prevailing and its influence felt up to 1 km. Ozone concentration is decreased in the compensative current zone of the sea breeze. The upward average concentration of O3 is nearly proportional to that of ground level.

**40834** **APTIC NO. 64665**

Watanabe, Kazuo

GAS EMISSION STANDARDS IN THE ODOR CONTROL LAW. *(Akushu boshiho ni yoru kitai haishutsu ni okeru kisei kijun ni tsuite). Text in Japanese. Akushu No Kenkyu (Odor Research J. Japan), 3(15):1-9, June 1974.*

The standard concentration of offensive odors from stacks is given based on the effective stack height and the total emission. A Gaussian plume model is generally used as the model for gas diffusion from a point source such as stacks, since the concentration distribution in the plane perpendicular to the wind direction can be approximated as a normal distribution. Diffusion equations including the Pasquill equation, Sutton equation, Cramer equation, and Leonard equation are all derived based on this model. The diffusion width of all odorous substances including aerosols is virtually the same since it is determined by atmospheric turbulent flow, mixing, random wind direction, and the diffusion coefficient can be evaluated by atmospheric stability which is determined by meteorological conditions, particularly the temperature variation in the vertical direction. The atmospheric stability was classified into 6 different stages, namely A to F, by the Pasquill-Gifford method. Final derivation showed that the standard concentration of odor is directly proportional to the total emission but inversely proportional to the square of effective stack height. The concentration is given as a 5-min value.

**40835** **APTIC NO. 64697**

*Weil, Jeffrey C.*

*THE RISE OF MOIST, BUOYANT PLUMES. J. Appl. Meteorol., 13(4):435t 443, June 1974. 12 refs.*

The governing equations for a moist, buoyant plume in a cross wind are presented. A comparison of energy equations for saturated and unsaturated plumes, the subject of some previous controversy, shows that the form of the two equations is identical only when the saturated plume is in a saturated atmosphere. In this case, the moist adiabatic lapse rate replaces the dry adiabatic lapse rate in the energy equation. Analytical results for the maximum plume rise and the distance to the maximum rise are obtained for a nearly horizontal, saturated plume in a stable, saturated atmosphere using the complete set of governing equations. Stable plume rise conditions exist for the saturated plume in a saturated atmosphere as long as the ambient temperature lapse rate is greater than a reference lapse rate. The reference lapse rate is slightly greater than the moist adiabatic lapse rate. Comparisons are made between the maximum plume rise and the maximum dry plume rise of Fay et al., and the maximum plume rise and the moist plume rise calculations of Hanna. (Author abstract)

**40836** **APTIC NO. 64857**

Wilkniss, P. E., R. E. Larson, D. J. Bressan, and Joseph Steranka

ATMOSPHERIC RADON AND CONTINENTAL DUST NEAR THE ANTARCTIC AND THEIR CORRELATION WITH AIR MASS TRAJECTORIES COMPUTED FROM NIMBUS 5 SATELLITE PHOTOGRAPHS. *J. Appl. Meteorol., 13(4):512-515, June 1974. 9 refs.*

Radon gas and airborne dust were used as chemical tracers to detect air masses over the ocean which had recently passed over land in the Antarctic and South Pacific. Dust particles greater than 2 micron in size were collected on dust kites which were suspended on the bow of the ship about 7 m above the sea surface. The dust was transported from the arid regions of the continents out over the oceans with the prevailing winds. The dust concentration is an integration over the duration of the dust kite flight. The values obtained for the dust concentrations are tabulated. The dust contained the key elements of iron, cobalt, and scandium, in proportions typical for continental rocks. Both Rn and dust were effective tracers. Comparison of shipboard measurements with air mass trajectories constructed from Nimbus 5 satellite photographs proves the value of the technique in remote areas and shows good agreement with respect to time of an event and air mass history.

**40837** **APTIC NO. 63214**

Yamashita, Shuji

A COMPARATIVE STUDY OF TURBIDITY IN AN URBAN AND A RURAL ENVIRONMENT AT TORONTO. *Atmos Environ., 8(5):507-518, May 1974. 14 refs.*

Values of Linke s turbidity factor in Toronto and at nearby rural locations were computed from the measurements of global and diffuse sky solar radiation on cloudless days. The turbidity factor was larger in the city than in the rural area through the year, except for some time in the summer. A comparison of turbidity factor for the same optical air masses and wind directions was also made. Annual mean values of about 3.0, 2.71, 2.54, and 2.74 turbidity were obtained for Toronto city, two locations in Scarborough, and at the Toronto Meteorological Research Station, respectively, the last two stations being rural. Mean monthly values for all stations showed higher turbidity during the summer than in the winter. The difference in the turbidity factor between the urban and the rural environments were larger in spring and autumn than in winter and summer. The turbidity factor was slightly larger in the afternoon than in the morning. The statistics on wind direction showed the effect of the urban atmosphere on turbidity. (Author abstract modified)

**40838** **APTIC NO. 64629**

Yokoyama, Nagayuki

STATISTICAL PREDICTION OF AIR POLLUTION CONCENTRATION. *(Taiki osen nodo no tokeiteki yosoku). Text in Japanese. Kogai (Hakua Shobo) (Pollution Control), 9(1-2):2-7, Jan.-March 1974. 6 refs.*

Part of studies made by the Air Pollution Monitoring System Dispersion Study Group in 1972 is presented. In an urban type pollution covering a large area, where the areas s dispersion capacity is close to saturation and where the yearly average of pollution concentration is high, the only control method is to reduce the total pollutant emission quantity. In newly developing industrial areas where the yearly average is still low but high concentrations appear under specific meteorological conditions, pollution can be avoided by forecasting high concentrations under a set of conditions and by controlling the total emission quantity. The linear prediction method, auto-correlation function method, multi-dimensional prediction method, and the Wiener and Kalman prediction filter method are discussed. A predictable time system must assume a constant dispersion rate over a long period of time and constant correlation functions. Therefore, the preparation of a prediction formula requires analyses of quantities of past data, eliminating daily fluctuations and adjusting averages. The prediction system must be as close to the model conditions as possible. Data from the Kurashiki Municipal Monitoring Center was used to study the daily fluctation pattern of the Mizushima Coastal Industrial belt, and the correlation coefficient of SOx measurements was obtained. Using three prediction models, predictions for one period cycle of 24 hours were examined and compared with actual measurements. With a slight time lag, good predictions were obtained.

**40839** **APTIC NO. 63215**

Zafiriou, Oliver C.

PHOTOCHEMISTRY OF HALOGENS IN THE MARINE ATMOSPHERE. *J. Geophys. Res., 79(18):2730-2732, June 20, 1974. 22 refs.*

Diatomic halogen molecules diffusing into the marine atmosphere are photodissociated to atoms in daylight more rapidly than they undergo other fates. The geochemistry of gaseous halogens is considered in terms of photolysis rates and the secondary reactions of the atoms produced. Diatomic halogens could be photolyzed predominantly by day and adsorbed on aerosols by night without yielding diurnal variations in currently measurable variables. Halogen atoms in the marine atmosphere react with ozone more rapidly than with other marine tropospheric constituents, this reaction yielding haloxy radicals that are also reactive. (Author abstract)

## 1973

**40840** **APTIC NO. 64537**

Dawson, G. A.

CHARGE LOSS MECHANISM OF HIGHLY CHARGED WATER DROPLETS IN THE ATMOSPHERE. *J.Geophys. Res., 78(27):6364-6369, Sept. 20, 1973. 11 refs.*

In previous studies of the instability of evaporating highly charged droplets, at atmospheric pressure the droplets became unstable, emitted smaller highly charged droplets and probably some ions, and regained stability. A study of the evaporation of charged droplets was applied to the atmosphere to determine if similar effects occur at the lower pressures found at cloud altitude. This laboratory study is described, and the experimental results and theoretical background are discussed. At moderate cloud altitude (about 4.5 km), highly charged drops of a radius of less than about 60 micron will undergo Rayleigh instability; drops greater than this size will instead lose charge by ion collection. At somewhat higher altitudes, charge loss for all drops will be by ion collection; conversely, as at sea level, instability will be the dominant loss process for all sizes of interest. The application of laboratory measurements of charge and loss to the atmosphere was far from trivial and required determination of as yet unknown discharge parameters. The results suggested values of generalized secondary coefficients of between 0.0001 and 0.00002 and an average detachment probability of small negative ions of about .0002. (Author abstract modified)

**40841** **APTIC NO. 62944**

Dickerson, M. H.

A MASS-CONSISTENT WIND FIELD MODEL FOR THE SAN FRANCISCO BAY AREA. *Preprint, World Meteorological Organization, Geneva (Switzerland) and International Assoc. of Meteorological and Atmospheric Physics (Ontario), 16p., 1973. (Presented at the WMO/IAMAP Symposium, Reading, England, May 14-18, 1973.)*

NTIS: UCRL-74265

A mass-consistent wind field model for the San Francisco Bay area was developed and tested. The wind and the height of the inversion base above the topography was adjusted such that the air mass is conserved and the observational data are changed in a minimum way. A surface of constraint is fitted to the observations in a least squares sense. The resulting equations lead themselves to a rapid numerical solution on the computer. These adjustments were necessary because of the of the complex topography and meteorology of San Francisco. For the summer and early fall, which is the period of interest in air pollution studies, there exists over the area an elevated subsistence inversion with a marine layer beneath. The air pollution model uses the mean wind within the mixed layer. These winds are derived through the use of the power law and based on surface observations of wind speed and direction.

**40842** **APTIC NO. 63180**

Fukuoka, Yoshitaka

METEOROLOGICAL STUDY OF AIR POLLUTION. (I) THE GENERAL AND SPECIFIC CYCLES FOR AIR POLLUTION. *Fukushima Daigaku Kyoikugakubu Rika Hokoku (Sci. Rep. Fac. Educ. Fukushima Univ.), no. 23: 51-64, Nov. 1973. 16 refs.*

Results are presented from meteorological studies in Japan concerning the general and specific periodicities of air pollution. Sulfur dioxide concentration shows a daily cycle with a maximum and minimum, while dustfall shows a semidaily cycle with two maxima and two minima per day. Weekly cycles are obscure in Japan, though in some polluted urban locations a reduction in pollution is observed on weekends. Maximum SO2 concentration and dustfall exist in the winter when the atmospheric stability is greater due to temperature inversion. Analyses of SO2 content variation for Onahama show some hourly periodicities, though it is not clear whether the periodicities are connected with weather conditions. Remarkable periodicities exist in mean daily SO2 concentrations in Onahama, with the SO2 concentration correlogram having an outstanding resemblance to mean daily air pressure and the frequency of anticyclonic pressure patterns. (Author abstract modified)

**40843** **APTIC NO. 63383**

Holland, H. R.

AMBIENT AIR QUALITY MANAGEMENT - A TOOL FOR SHARING THE AIR. *Proc. Am. Petrol. Inst., Div. Refining, vol. 53:87-100, 1973. 2 refs.*

Careful consideration of the topography, climate, and distribution of sources in air quality management can demonstrate alternate methods of controlling emissions. Two recent experiences in the application of ambient air quality monitoring to control techniques are described. The first concerns the valley of the St. Clair River where the presence of Lake Huron results in lake breeze effects and frequent low level inversions. Control of sulfur dioxide and other pollutants from the industrial sources along the river is difficult. Results of a study in this area and locations of probable sources for SO2 incidents with the wind from various directions are presented. Fumigation, looping, and inversions caused 17, 73, and 10% of the total SO2 incidents, respectively. The second case concerns an investigation to determine SO2 ground level concentrations in the vicinity of a Dartmouth refinery and the contribution of the refinery to them under a variety of atmospheric conditions. Refinery stacks were short with low exit velocities. The downwashing and looping of the plumes at wind velocities of 20 mph were responsible for 65% of the measurement of above 250 micrograms/cu m SO2. Low level inversions in calms or at very low wind produced 25%. Fumigations at inversion breakup were responsible for 10%. Other applications of air monitoring programs are reviewed briefly.

**40844** **APTIC NO. 64775**

Lehmann, A.

COMPUTATION OF POLLUTED FIELDS AS A BASIS OF EVALUATION FOR SPACE PLANNING. *(Die rechnerische Ermittlung von Immissionsfeldern als Bewertungsgrundlage fuer die Territorialplannung). Text in German. Idojaras (Budapest), 77(3):149-154, 1973. 3 refs.*

In the statistical evaluation of air pollution data, the formula of Bosanquet and Pearson is not an adequate representation of the diffusion of pollutants. The East German Meteorological Service uses a model which is based on a two-dimensional Gaussian distribution: the wind velocity in the diffusion layer is expressed as the mean of its squares, the standard deviation as a function of the distance from the source of the pollutant. Diffusion conditions are characterized by the frequency distributions of wind direction, wind velocity, and degree of stability; the latter is determined from synoptic weather observations by Uhlig s method. The computed results serve as the basis for locating potential sources of pollution where they will cause the least harm.

**40845** **APTIC NO. 62980**

Machta, L.

SOURCES AND SINKS FROM PROFILE DATA. *In: Atmospheric Transport and Dispersion of Pollutants and Related Meteorological Studies, July 1971-June 1972. National Ocean and Atmospheric Administration, Silver Spring, Md., Air Resources Lab., NOAA-TM-ERL-ARL-40, p. 11-18, March 1973. 5 refs.*

An empirical trial-and-error method is described for studying the diffusion and transport of various pollutants. The modeling is used to determine the atmospheric profile including sources and sinks for ozone, carbon monoxide, and methane. The method gives the correct order of O3 destruction at the ground by using only two European profiles. This suggests that the diffusion coefficients are not grossly wrong. Destruction of CO occurs just above the tropopause in temperate latitudes. When extrapolated to the entire earth, about 2 times 10 to the 11th power g/yr are destroyed in this region. The constant CO profile from 11 to 12 km indicates no net formation or destruction above 11 km; this does not preclude formation and destruction rates above 11 km so long as the two approximately balance one another. Most of the CH4 is also destroyed just above the tropopause. The total destruction of methane in the stratosphere is estimated to be about 5 times 10 to the 13th power g/yr. (Author conclusions modified)

**40846** **APTIC NO. 62948**

Machta, L. and K. Telegadas

PREDICTION OF CO2 IN THE ATMOSPHERE. *In: Atmospheric Transport and Dispersion of Pollutants and Related Meteorological Studies, July 1971-June 1972. National Oceanic and Atmospheric Administration, Silver Spring, Md., Air Resources Lab., NOAA-TM-ERL-ARL-40, p. 1-10, March 1973. 10 refs. (Presented at the Brookhaven Symposium in Biology, May 16-18, 1972.)*

Predictions of future and past carbon dioxide concentrations are derived from a simple multireservoir exchange model: stratosphere, troposhere; mixed layer of the ocean, deep ocean; short-term land biosphere, long-term and biosphere, and marine biosphere. All exchanges are prescribed from literature or personal estimates, except the troposphere-mixed ocean layer, which is obtained from a trial-and-error procedure using bomb carbon(14)dioxide as a tracer. The CO2 content predicted for the year 2000 is about 385 ppm compared with the present 320 ppm, if the estimates of the growth in the use of fossil fuel are reasonable. The uncertainties in the model are probably less significant when using the above procedure than the assumption that the oceans and biosphere will continue to behave in the future as they did in the 1960 s. The so-called greehouse effect, using a simplified one-dimensional (vertical) model of the atmosphere, calls for about 0.5 C warming from the increase of CO2 to 385 ppm. But this estimate is on even shakier ground than the forecast of future CO2 concentrations. (Author abstract)

**40847** **APTIC NO. 56877**

Nesterov, G. T. and Ye. M. Apostolov

ASSAY OF NITRIC OXIDE MESOSPHERE CONCENTRATION BY ABSORPTION MEASUREMENT. *(Opredeleniye kontsentratsii okisi azota v mezosfere metodom izmereniya pogloshcheniya). Text in Russian. Geomagnetizm i Aeronomiya, 13(5):887-890, 1973. 20 refs.*

The vertical and seasonal variations in the nitric oxide concentrations in the mesosphere were studied on the basis of absorption measurements performed at an equivalent frequency of 2 MC/s in 1970. The seasonal variation of the NO concentrations was characterized by a maximum in summer, especially at 70 km altitude. The NO concentration measured in winter beyond the mesopause substantially exceeded the values measured in summer. The observed vertical and seasonal variations in the NO concentrations in the mesosphere may be due to seasonal changes in the absorption of long and medium valves.

**40848** **APTIC NO. 63302**

Nordo, J.

PRELIMINARY NOTES ON LARGE SCALE MASS TRANSPORT (PAPER V). *In: The Fluid Dynamics Aspects of Air Pollution Related to Aircraft Operations. Norwegian Inst. for Air Research, Advisory Group for Aerospace Research and Development-AR-55, p. 31-39, 1973.*

Circulation caused by urban heating over a city will often have the dimension of a mesoscale. The intensity of this circulation, as well as the resulting flow patterns, depend on the synoptic flow. The urban region of Oslo at the bottom of the Oslofjord is discussed for topographic effects, mesoscale transport of pollutants, and transport of pollutants from a volcano. A space correlation analysis was performed of monthly averages of station pressure and precipitation to study the scales of mean circulation over Europe. The data were collected for 1881-1930. The pressure and precipitation data can be used as a guide in designing a network of stations measuring air pollution. In some special synoptic situations, mainly in the outskirts of a high, the air has no vertical velocity, and has high static stability, which can cause high concentrations of pollution. If the moisture content is relatively high, and the wind velocity is moderate, very acid drizzle or light rain can be released by orography. An example is given of such a case of acid precipitation in south Norway due to long range transport of sulfur from the industrial centers of Western Europe. A network is proposed to provide information about the transport and transformation of emitted sulfur components. The network will combine meteorological and air pollution measurements. Analysis of the data will include the data collected, results of emission surveys, statistical and diffusion analyses, and ground and airplane sampling.

**40849** **APTIC NO. 60700**

Pandolfo, Joseph P. and Clifford A. Jacobs

TESTS OF AN URBAN METEOROLOGICAL-POLLUTANT MODEL USING CO VALIDATION DATA IN THE LOS ANGELES METROPOLITAN AREA, VOLUME I. (FINAL REPORT). *Center for the Environment and Man, Inc., Hartford, Conn., Environmental Protection Agency Contract 68-02-0223, Proj. 4121, Rept. 490-A, EPA-R4-73-025a, 182p., May 1973. 18 refs.*

The urban boundary layer model described by Pandolfo in 1971 was modified and used in 40 test runs. Many of the runs varied the meteorological input about a standard set. An economical, objective, physically consistent, and precisely specified procedure was achieved for obtaining and predicting the three-dimensional meteorological fields needed. In several of the runs, the input topography, land-water distribution, and other physical characteristics of the underlying surface was varied. The results demonstrate that ready generalization to other regions can be expected. The modeled regions was simulated with relatively coarse (8-mile) grid spacing. This is in contrast to other models which deal with pollutants only, and which are based on 2-mile grid spacing. The temporal and spatial variations of air temperature, humidity, and wind were simulated with an encouraging degree of realism. Temporal and spatial variations of carbon monoxide were also simulated fairly realistically. (Author abstract modified)

**40850** **APTIC NO. 60846**

Pecille, Joseph A.

WIND AND DUST STUDY FOR LUBBOCK, TEXAS. *National Oceanic and Atmospheric Administration, Fort Worth, Tex., National Weather Service, NOAA-TM-NWS-SR-70, 9p., July 1973. 2 refs.*

A study of 87,660 observations of wind velocity and related occurrence of dust at Lubbock, Texas during the period of 1951-1960 is reviewed. A total of 2073 cases had dust occurring at the time of observation during the period of study, representing 2.37% of the total number of observations. Occurrence of dust was reported on National Weather Service surface observations when the visibility decreased to less than seven miles because of dust. Calculations of the amount of dust associated with 10 dust storms were made by Warn and Cox for the 1950 dust season to give some idea of magnitude of the dust problem in the Lubbock area. The calculations were based on samples of dust amounts over a 5 mile wide strip across the city. A total of 17566.2 tons of sediment were calculated to have crossed the strip during these 10 dust storms, and the average was 121.8 tons/hr/storm. Dust occurrences in the Lubbock area of two basic types. The first is local due to weather conditions in the immediate area. The second type is the large scale dust storm associated with synoptic scale low pressure systems or troughs occurring along the eastern slopes of the Rocky Mountains. Winds around a low pressure system often develop sustained velocities of 25 knots or more while the low moves from west to east across the Lubbock area. Wind rose data combined with topographical features, soil classification, and meteorological conditions are presented and treated according to arbitrarily selected directional sectors.

**40851** **APTIC NO. 60423**

Shiozawa, Kiyoshige, Atsushi Otaki, Shinichi Okamoto, Junichi Yamane, and Jun Hiroo

STUDIES ON THE PREDICTION OF AIR POLLUTANT CONCENTRATION (VI). *(Taiki osen nodo yosoku ni kansuru kenkyu (VI)). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Polluton), 8(3):552, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973, Paper 277.)*

The quantitative prediction of oxidant concentrations using atmospheric pressure patterns was studied. Using a daily weather map of Tokyo, the oxidant concentration was calculated by double regression using 13 parameters. The parameters were dummy variables using the pressure location as one and others as zero. The 1971 and 1972 oxidant daily averages and daily maximums data were used for calculation checks. The correlation coefficients ranged between 0.4 and 0.7, and generally, the daily average correlations were higher than the daily maximum correlations. Locally, the correlations were higher in the eastern polluted areas and lower in the western suburban cities outside Tokyo. Partial regression coefficients for high pressure, low pressure, front, in various sea locations, and on holidays are presented. The actual measurements and calculated figures by double regression analysis are compared. In low concentration levels, prediction errors are very small, but in an extremely high concentration level, the errors are greater.

**40852** **APTIC NO. 63408**

Mito Regional Weather Observatory

METEOROLOGICAL ANALYSIS AND INVESTIGATION OF PHOTOCHEMICAL SMOG FORMATION IN IBARAKI PREFECTURE. *(Ibaraki-ken ni okeru kokagaku sumoggu hassei no kisho kaiseki chosa ni tsuite). Text in Japanese. Tokyo Kanku Chiho Kisho Kenkyukai-shi (Geophys. Notes Tokyo Dist. Meteorol. Obs.), no. 6:113-116, 1973.*

A survey of photochemical smog warnings issued between July and October 1972 in the Kanto region reveals that the warning was most frequently issued in Ibaraki prefecture with its 24 warnings, follwoed by Tokyo s 23 times, Chiba s 17 times, and Saitama s 10 times. There were more frequent high concentrations in Ibaraki than in other areas, and the concentration average was also higher. The reason is not clear, but the analyses seem to suggest an overlap of gathering of inland-formed winds early in the morning and the sea breeze front from the Tokyo area. When the sea breeze from the Tokyo area does not blow, the inland wind alone does not create an extraordinarily high concentration of oxidant. The highest concentration during the day is at most 0.12 ppm. Various types of high oxidant concentration, winds, altitudes, and microweather analyses with weather maps are presented. The daily analyses of weather and smog factors between August 1 and 16 are presented with regard to the diurnal wind speed average at Mount Chikuba, maximum temperature, inversion altitude, mixed layer altitude, temperature difference between Mount Chikuba and Tateno, wind directions at Mito and Chikuba, the maximum temperature in the prefecture, the oxidant type, and remarks and general evaluation.

**40853** **APTIC NO. 64851**

Kanagawa Prefectural Government (Japan), Pollution Control Center

AIR POLLUTION FORECASTING IN KANAGAWA PREFECTURE: (THE RELATIONSHIP BETWEEN AIR POLLUTION AND WEATHER IN WINTER. *(Kanagawa-ken ni okeru taiki osen yoho--toki no taiki osen to kisho no kankei). Text in Japanese. Kanagawa-ken Taiki Osen Chosa Kenkyu Hokoku (Tech. Rept. Air Pollution Yokohama- Kawasaki Ind. Area), no 15:135-167, Feb. 1973.*

The daily pollution forecasting for sulfur oxides concentration was put in practice from December 1, 1970 to March 31, 1971 in Kanagawa Prefecture. The data on heavy oil consumption and meteorological conditions such as pressure pattern, wind direction, wind velocity, effect of sea and land winds, and the formation of a local discontinuity line were compiled and analyzed inrelation to the pollutant concentration. The pressure patterns associated with high pollutant concentrations were classified into six types, and the possible occurrence of these six types of pressure patterns was forecasted, thus predicting potentially high pollutant concentrations. The forecasts made at 10 am for the day and at 4:30 pm for the following day were compared with actual measurement data and recorded along with all meteorological factors for each day. The incidence of high pollutant concentration was most frequent between 10:00 am and 1: 00 pm. High pollutant concentration areas were located in Yokohama Tsurumi district and the entire area around Kawasaki. Pressure patterns associated with high pollutant concentration were H1, H2, H3, and FL, and the occurrence of local discontinuity lines had a great effect on high pollutant concentrations. Major factors for the occurrence of a discontinuity line were low pressure and frontal formation. Low wind velocity at 9 am was a contributing factor for high pollutant concentration, and stable temperatures over a month showed a high incidence of high pollutant concentration. The air pollution forecasting enforcement specifications published by Tokyo Metropolitan Government and Kanagawa Prefectural Government are described.

## 1972

**40854** **APTIC NO. 63008**

Baluteau, J. P., E. Bussoletti, P. Lena, and A. Marten

HIGH-RESOLUTION SPECTRA OF THE STRATOSPHERE BETWEEN 30 AND 200 CM. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 99-105. 15 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

Preliminary results of the measurement of stratospheric emission spectra in the 30-200/cm range are presented. The spectra were obtained with a phase modulated Michelson interferometer installed aboard a Caravelle. The flights were made at altitudes varying between 37,000 and 41,000 ft for a total of 16 hr of measurements. The main features of the spectra are due to water lines; oxygen and ozone lines are also easily identified. Other lines are tentatively identified as carbon monoxide, nitric oxide, and nitrous oxide. (Author abstract modified)

**40855** **APTIC NO. 63004**

Barrett, E. W., P. M. Kuhn, and A. Shlanta

RECENT MEASUREMENTS OF THE INJECTION OF WATER VAPOR AND OZONE INTO THE STRATOSPHERE BY THUNDERSTORMS. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 34-46. 7 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

Water vapor and ozone in the stratosphere were measured in the vicinity of thunderstorms which reached or penetrated the tropopause during Aug. and Sept. 1972. All instrumentation was modified for unattended operation on the aircraft; data were recorded on the aircraft analog magnetic tape logging system. Two storms were studied extensively; one which penetrated 3000 ft above the troposphere, and another which just reached to the tropopause level. In both cases, water vapor overburdens above and downwind averaged some 40% higher than those upwind of the storms. Ozone concentrations above the deeper storm were about 35% higher than those away from the storm while those above the weaker storm were 10-20% less than those in undisturbed air. It appears that thunderstorms inject substantial amounts of water vapor into the stratosphere and that growing electrically active storms also generate O3 at their tops. (Author abstract modified)

**40856** **APTIC NO 53023**

Bauer, Ernest

DISPERSION OF TRACERS IN THE STRATOSPHERE. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 254-262. 20 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

Data on the dispersion of tracers as a function of time after injection are presented for a variety of altitude regimes over times from seconds to a year. Within the admittedly wide range of variability of the data there is no evidence of different behavior for the horizontal dispersion between the atmospheric boundary layer, troposphere, and stratosphere. The possible theoretical interpretations of the data and its utility in predicting exhaust dispersion and reactant concentrations at distances from 100-1000 km behind a vehicle flying in the stratosphere are discussed. (Author abstract modified)

**40857** **APTIC NO. 62949**

Cadle, Richard D.

COMPOSITION OF THE STRATOSPHERIC SULFATE LAYER. *Eos, 53(9):812-820, Sept. 1972. (Presented a the Dept. of Transportation Climatic Impact Assessment Program Symposium Cambridge, Mass., Feb. 15-16, 1972.)*

The relationship between man s activities and pollution in the stratosphere is discussed. Man s activities increase the particle loading of the stratosphere in several ways. Man produces sulfur dioxide, largely from combustion, which enters the stratosphere and is converted to sulfuric acid droplets. During periods of low volcanic activity, this addition may increase the background concentration of stratospheric particles about 50% by the year 2000. This is in addition to the artificially produced particles in polluted tropospheric air that enters the stratosphere. Jet aircraft often fly in the stratosphere emitting particles and gases which become particles by chemical reactions. Most of these planes now fly slightly above the tropopause, and the exhaust emissions are fairly rapidly removed from the atmosphere by natural processes.

**40858** **APTIC NO. 64552**

Carlson, Toby N. and Joseph M. Prospero

THE LARGE-SCALE MOVEMENT OF SAHARAN AIR OUTBREAKS OVER THE NORTHERN EQUATORIAL ATLANTIC. *J. Appl. Meteorol., 11(2): 283-297, March 1972. 23 refs. (Also: In: Collected Reprints-1972. Volume I. Atlantic Oceanographic and Meteorological Laboratories. National Oceanic and Atmospheric Administration, Miami, Fla., Atlantic Oceanographic and Meteorological Labs., p. 180-194, July 1973.)*

GPO

The intense and prolongged heating of air passing over the Sahara during the summer and early fall forms a deep mixed layer which extends up to 15,000-20,000 ft during July, the warmest month. The dust-laden heated air emerges from West Africa as a series of large-scale anticyclonic eddies which move westward over the tropical Atlantic above the tradewind moist layer. This Saharan air is characterized by high values of potential temperature, dust, and radon-222 which confirm a desert origin. As the air within the layer proceeds across the Atlantic, the continuous fallout of particulate matter and the mixing at the base of the layer cause dust to be transferred to the lower levels where its concentration may become sufficiently great to produce dense haze at the surface over wide areas over the Atlantic and Caribbean in the latitude belt 10-25 N. Nevertheless, the dust concentration and associated haziness are greater at 10,000 ft than at the surface. The meteorological aspects of thy movement of the Saharan air, the structure of the dust layer as revealed by airborne measurements, the large scale movement of the Saharan dust plume, and radiational cooling and vertical motions in the dust layer are described. A model is proposed which depicts the movement of Saharan air from Africa to the Caribbean and its interaction with African disturbances. Although it is not known what effect, if any, the dust plume has upon the growth or suppression of disturbances, it is clear that the warmth of the Saharan air has a strong suppressive influence on cumulus convection and that, as a result, the advancing dust pulse is often marked by rapid clearing behind the disturbances. (Author abstract modified)

**40859** **APTIC NO. 63028**

Chang, Julius S.

COMMENTS ON THE POSSIBLE EFFECT OF NOX INJECTION INTO THE STRATOSPHERE BY ATMOSPHERIC NUCLEAR WEAPONS TESTS. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 338-339. 6 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

Recent studies suggest that the atmospheric nuclear weapons tests in the 50 s and 60 s injected significant amounts of nitrogen oxides into the stratosphere. It is suggested that there was no effect on stratospheric ozone. A model study was made which indicates that the maximum reduction in O3 would occur approximately 250 days after nitric oxide injection and would amount to less than 15% reduction in total O3. It appears that NO does affect O3.

**40860** **APTIC NO. 63009**

Dutsch, H. U.

THE PRESEN STATUS OF OZONE RESEARCH: PHOTOCHEMISTRY AND OBSERVATIONS. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 106-113. 32 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

Recent theoretical developments in the chemistry of ozone are discussed. Reactions between O3 and HO2 and hydroxyl are much slower than initially assumed. The direct influence of water vapor photochemistry on the odd oxygen budget is almost negligible below 35 and 40 km. Nitrogen oxides play a considerable role in O3 photochemistry below about 40 km. Nitrogen oxides are produced in the stratosphere by the reaction of nitrous oxide which originates in the troposphere with O(superscript D), a photodissociation product of O3. The most simple transport model does not suffice to treat O3 transport itself because the source for N2O and methane, which is at the ground, is hardly uniform over the earth s surface.

**40861** **APTIC NO. 63006**

Farmer, Crofton B., Robert A. Toth, Rudolph A. Schindler, and Odell F. Raper

NEAR-INFRARED INTERFEROMETRIC MEASUREMENTS OF STRATOSPHERIC COMPOSITION TO BE MADE FROM THE CONCORDE. *Dept of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program. 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 65-77. 23 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

A series of stratospheric observations to be made from the Anglo-French SST Concorde prototype (001) during early 1973 are described. They are to obtain an inventory of stratospheric neutral trace species, to determine accurate abundance values for each, and to investigate their vertical distributions. Adequately low levels of carbon dioxide, carbon monoxide, nitrous oxide, nitric oxide, nitrogen dioxide, sulfur dioxide, ozone, water and the lower hydrocarbons will be observable. Minimum detectable concentrations lie within the range of 10 to the -8th power to 10 to the -10th power for observations made at aircraft altitudes of 15-20 km. The instruments detection capability should allow the spatial and temporal variations of many of these species to be determined. (Author abstract modified)

**40862** **APTIC NO. 63010**

Garvin, David and Robert F. Hampson

EVALUATED RATE AND PHOTOCHEMICAL DATA FOR MODELING OF THE STRATOSPHERE. *Dept. of Transportation, Cambridge, Mass., Transporation Systems*

*Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 114-125. 31 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

The relationship between the polluted troposphere and stratospheric chemical models is discussed. At ground level in photochemical smog, ozone is a product, and it increases with time during the day. Photochemical smog is initiated by the nitrogen dioxide photolysis reaction. This is raised as an objection to the conclusion that nitrogen oxides will reduce the ozone concentration in the stratosphere. Because the starting conditions in the troposphere and stratosphere are widely different, there is little reason to expect the same overall effects from the operation of a common chemical mechanism. Three important types of input data for studies of the chemistry of the stratosphere are rate constants, absorption coefficients, and quantum yields for elementary processes. About 135 of these data items are needed for studies that will define the chemistry of the stratosphere. These data are being obtained both by experiment and by review and evaluation of existing measurements. The data-evaluation program has two parts: evaluation by the National Bureau of Standards, and a cooperative survey by a large number of gas kineticists. The evaluated data now available are summarized in a table. The possible interactions among 42 species that may be present in the stratosphere are displayed on a reaction grid. Where possible the importance of a reaction and the status of its data are indicated. Pollutants introduced into the stratosphere will interact with the existing complex ozone/oxygen/nitrogen oxides/HOx photolytic system. Laboratory studies of the ozone/oxygen and ozone/hydrogen peroxide photolytic systems and rate measurements in an O/ozone/nitrogen oxides system illustrate the types and magnitudes of effects to be expected. (Author abstract modified)

**40863** **APTIC NO. 63038**

Grobecker, Alan J., Giichi Yamamoto, Jacques Blamont, A. J. Dyer, Harold Johnston, Elmar Reiter, and William Kellogg

THE CLIMATIC IMPACT OF POLLUTANTS INJECTED INTO THE STRATOSPHERE. PANEL DISCUSSION. *Dep't. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 407-415. (Nov. 14-17.) (Available from the National Technical Information Service.)*

The relationship between gases of the troposphere and stratosphere and climate is discussed. In the northern hemisphere, the ozone distribution does not follow isentropic patterns; a large transport toward the lower altitudes is definitely present. There is a correlation between the total integrated ozone content and the tropopause altitude which indicates that the O3 concentration is largely controlled by the loss at the tropopause, not by what happens in the stratosphere. The effect of tropospheric-stratospheric exchange process for O3, particularly in temperate latitudes, has been identified almost to the order of magnitude of tonnage. Evidence on the long term trend in tropopause heights at various equatorial stations suggests that the equatorial tropopause was relatively low in 1963. This trend should have a significant effect on the amount of moisture and nitrogen oxides which seep into the stratosphere.

**40864** **APTIC NO. 63025**

Hesstvedt, Eigil

COMMENTS ON PHOTOCHEMICAL MODELING. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC- OST-73-4, p. 285-290. 1 ref. (Nov. 14-17.) (Available from the National Technical Information Service.)*

Rates of formation and destruction of oxygen (P superscript 3), odd O2, hydroxide, HO2, hydrogen peroxide, odd hydrogen, H2, and water, derived without transport are presented as a function of altitude from 10 to 70 km. When an earlier two dimensional model of the ozone layer with transport is modified by the nitrogen oxides profile the agreement between calculated and observed O3 distribution is improved. (Author abstract modified)

**40865** **APTIC NO. 63003**

Hofmann, D. J., J. M. Rosen, T. J. Pepin, and J. L. Kroening

GLOBAL MEASUREMENTS OF STRATOSPHERIC AEROSOL, OZONE, AND WATER VAPOR BY BALLOON-BORNE SENSORS. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 23-33. 4 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

The existence of an extensive dust layer in the northern hemisphere in the 300-350 mb region was detected by balloon borne sensors in June 1972. The submicron dust is presumably due to the volcanic eruption of Alaid and was tracked as a function of time from Laramie, Wyo. Dissipation was rapid and no significant stratospheric aerosol injection was apparent. The particle size ratio of the persistent tropospheric layers is consistent with that of stratospheric aerosols. The persistent layers probably consist of particles larger than those of tropospheric features such as cirrus clouds. The short term dispersion occurred along lines of constant pressure and spread out at least one degree of latitude per day. A total of 44 balloon soundings were made measuring ozone and water vapor in the stratosphere. Aerosol measurements at the poles suggest stratospheric concentrations and size distributions which are similar to those observed presently at northern hemisphere midlatitudes. The stratospheric aerosol does not appear to be affected by local habitation, but is global phenomenon. (Author abstract modified)

**40866** **APTIC NO. 63024**

Hoshizaki, H., L. B. Anderson, and R. J. Conti

HIGH-ALTITUDE AIRCRAFT WAKE DYNAMICS. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST- 73-4, p. 263-284. 31 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

An analysis of the chemically reacting wake behind an aircraft was performed. They first grow principally in the vertical direction, due to detrainment from the sinking vortex pair, and then primarily in the horizontal direction, due to wind shear, wake turbulence, and gravitational collapse. At the point at which aircraft induced effects become negligible and the atmospheric environment begins to control the wake growth, the wake dimensions are approximately 1000 m in width and 500 m in height. Chemical reactions were significant only in the near field of the jet engine exhaust. Hydrocarbon oxidation reduces the hydrogen, hydroxyl, and oxygen levels by many orders of magnitude. No significant conversion of nitrogen dioxide to nitric acid took place. (Author abstract modified)

**40867** **APTIC NO. 63021**

Hudson, Frank

THE DESIGN OF CHEMICAL-RELEASE EXPERIMENTS IN THE STRATOSPHERE. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 237-246. (Nov. 14-17.) (Available from the National Technical Information Service.)*

The interaction of mathematical simulation with the design and interpretation of experiments on chemical kinetics is explored, first for a laboratory study and then for a chemical release in the stratosphere. Several chemical release experiments are simulated, in order to learn which ones would give measureable and meaningful results. A real experiment would be difficult and complex, but none of the unsolved problems seems insurmountable. (Author abstract modified)

**40868** **APTIC NO. 62895**

Hummel, John R.

COOLING TOWERS AND WEATHER MODIFICATION. *In: Pollution: Engineering and Scientific Solutions. Euval S. Barrekette (ed.), New York, Plenum, 1972 (?), p. 19-25. 5 refs.*

At present, the power industry must dispose of 1.3 watts of heat for every watt of generating capacity at a coal-fired steam generating plant and about 2 watts of heat/watt at a nuclear power plant. A common practice for cooling makes use of a cooling tower to take hot water used as a coolant by the generating station, pass it through air to cool the water to allow for recirculation, and release thy heated air. Unfortunately, the released heat and water vapor can modify local weather conditions. At a refining facility in Philadelphia, the plume causes fog which clouds an expressway at certain times. Natural draft cooling towers may have long-term effects on the climate. Cooling towers have the potential to produce fog and drizzle, initiate clouds, and enhance rainfall. The potential hazards of fogs or other inadvertent weather modifications can be lessened through research, locating towers away from highways, and examination of a chosen site s local meteorological conditions.

**40869** **APTIC NO. 63029**

Johnston, Harold, Garry Whitten, and John Birks

THE EFFECT OF NUCLEAR EXPLOSIONS ON STRATOSPHERIC NITRIC OXIDE AND OZONE. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 340-350. 10 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

A detailed examination of the total ozone data for the world was made to determine if atmospheric nuclear bomb tests have introduced significant quantities of nitric oxide into the stratosphere. Data show a statistically significant decrease of stratospheric $O_3$ during the period of intense nuclear bomb testing, 1960-1962, and a larger, statistically significant increase of total $O_3$, 1963-1970, after cessation of large scale atmospheric nuclear testing. These trends may have other explanations, but their location and timing are consistent with the distribution of carbon-14 and strontium-90 in the stratosphere. (Author abstract modified)

**40870** **APTIC NO. 64524**

Kuhn, Michael

GLOBAL POLLUTION IN ANTARCTIC AIR DOCUMENTED BY SOLAR RADIATION DEPLETION. *Antarctic J. (U. S.), 7(2):35-37, March-April 1972. 17 refs.*

It has been proposed that the Antarctic atmosphere should be taken as a reference of the state of worldwide air pollution because pollutants are integrated during their long journey to Antarctica, and only long-term fluctuations would be recorded there. Regular circulation and predominantly anticyclonic weather in Antarctica facilitates the analysis of individual samples by minimizing local influence. One indicator of the amount of aerosols in the air is the decrease in direct solar radiation reaching the earth s surface. Reports of solar radiation in Antarctica for 1950-1968 were studied. The accuracy of coefficient for absorption of solar radiation was + or - 0.003 at best. The results showed the influences of volcanic ash, increased industry, and aerosol movement. The coefficient for absorption of solar radiation increased by 20% over eight years.

**40871** **APTIC NO. 63027**

McCracken, Michael C.

ZONAL ATMOSPHERIC MODEL ZAM2. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 298-320. 32 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

The update of the zonal atmospheric two dimension general circulation model (ZAM2) with a 5 degree latitude grid that is presently being extended vertically into the stratosphere is described. Although longitudinal derivatives are set to zero and a mechanism simulates the meridional transport by horizontal waves and eddies, proportional surface coverage at each latitude allows for continental and oceanic contrast. The thermodynamics and hydrology of a moist atmosphere, including the effects of solar and long wave radiation, cloudiness, condensation, evaporation, surface frictional drag, and subgrid convection are simulated. Surface temperature and water vapor are determined by a surface energy-balance calculation. The computational cycle involves a time step of 15 min; it can be iterated for several years of atmospheric time. Application to the Climatic Impact Assessment Program will involve sensitivity and perturbation studies, introduction of interactivy kinetics, and analysis of the potential effect of several pollutant species distributions. (Author abstract)

**40872** **APTIC NO. 63005**

Machta, L. and K. Telegadas

EXAMPLES OF STRATOSPHERIC TRANSPORT. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 47-56. 10 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

Radioactivity concentrations and ratios in stratospheric air samples to 30 km describe the latitudinal and vertical spread of stratospheric debris from a stratospheric source. Several French detonations in 1968 and 1970 should have injected debris up to 1/km at most in the stratosphere, with the bulk of the debris remaining in the tropical troposphere. They can be ruled out as a significan contributor to the stratospheric radioactivity concentrations. On Sept. 29, 1969, China detonated a 3 MT high yield device at 40 degrees N. The spread of this debris, which could be followed for about a year, and its stratospheric depletion are discussed and compared with patterns from other nuclear tests. (Author abstract modified)

**40873** **APTIC NO. 63007**

Murcray, D. G., A. Goldman, F. H. Murcray, W. J. Williams, J. N. Brooks, and D. B. Barker

VERTICAL DISTRIBUTION OF MINOR ATMOSPHERIC CONSTITUENTS AS DERIVED FROM AIR-BORNE MEASUREMENTS OF ATMOSPHERIC EMISSION AND ABSORPTION INFRARED SPECTRA. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 86-98. 11 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

Mixing ratio altitude profiles of minor atmospheric constituents were derived from infrared balloon borne spectroscopic observations. The observations were made from various altitudes using a solar spectrometer, spectral radiometers, and filter radiometers. The spectrometer is used to measure atmospheric absorption using the sun as a source; the radiometers are used to measure atmospheric emission. The current spectral resolution is approximately 0.3/cm for the absorption spectra and aproximately greater than 2/cm for the emission spectra. The available data cover the spectral region from 1-30 micron. The vertical distributions of water, carbon monoxide, and nitrous oxide are presented based on a line by line/layer by 4ayer emission and absorption analysis and for nitric acid based on statistical band model analysis. (Author abstract)

**40874** **APTIC NO. 63013**

Nicolet, Marcel, Frederick Kaufman, Paul J. Crutzen, Michael B. McElroy, and Julius London

STRATOSPHERIC AERONOMY PANEL DISCUSSION. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST- 73-4, p. 154-168. (Nov. 14-17.) (Available from the National Technical Information Service.)*

The relationship between gases in the troposphere and stratospheric aeronomy is discussed. Methane is not produced in the stratosphere, but it flux from the troposphere represents a large source of free hydrogen for the stratosphere. The oxidation of CH4 is a major source of stratospheric water which indicates the stratosphere is a source, rather than a sink of tropospheric water. The oxidation of CH4 and carbon monoxide in the troposphere may lead to an important contribution to tropospheric ozone. The amount of O3 produced in the troposphere may equal or be larger than the estimated flux of O3 into the boundary layer of the troposphere. The aeronomy of atmospheric ammonia was modeled taking into consideration that most of the ammonia condenses and is carried out of the troposphere by rain. A significant amount gets into the stratosphere. For the troposphere as a whole, NH3 is almost certainly a very significant source. It falls off very rapidly with height in the stratosphere and is probably a better natural indicator of the behavior of SST (supersonic transport) effluent than nitrogen oxides.

**40875** **APTIC NO. 64592**

Pytkowicz, R. M.

FOSSIL FUEL BURNING AND CARBON DIOXIDE: A PESSIMISTIC VIEW. *Comments Earth Sci. Geophys., 3(1):15-22, June-July 1972. 11 refs.*

The climatic and ecological consequences of adding carbon dioxide to the atmosphere by the burning of fossil fuels are evaluated, assuming that the present accelerating rate of fossil fuel burning will continue. The estimates are based on a 4.5% per year fossil fuel consumption increase, which is capable of exhausting the fossil fuel supply in the next 108 years. The atmospheric content of CO2 with the maintenance of present fuel burning trends is estimated to be capable of increasing by a factor of 15.3, with CO2 in the wind-mixed layer increasing by a factor of 2.43, over the next 100 years. This increase is capable of producing a temperature increase of as much as 20 C during the same time duration, with a 10 C increase in temperature being possible by the mid-decades of the next century.

**40876** **APTIC NO. 62947**

Roffman, Amiram

PROFILES OF THE NATURAL CONTAMINANT RADON 222 AS A MEASURE OF THE VERTICAL DIFFUSIVITY. *Preprint, Society of Engineering Science, St Louis, Mo., 15p., 1972. 9 refs. (Presented at the Pollution Engineering and Scientific Solutions, Proceedings of the International Meeting of the Society of Engineering Science, 1st, Tel Aviv, Israel, June 12-17, 1972.)*

The vertical eddy diffusion based upon profiles of the natural contaminant Radon 222 was investigated. The temporal and spacial variations in 222 Rn concentrations are affected by vertical transport and advection, radioactive decay, and 222 Rn emanation from the ground. The average values of the vertical eddy diffusion coefficient obtained in this analysis are in good agreement with those previously reported in the literature. Early morning results reveal that averaging 222 Rn concentrations over long periods of time when thermal inversion dissipates and convection due to ground heating initiates is insufficient to represent temporal variations of the vertical diffusivity. There is a change by a factor of 25 the vertical eddy diffusion coefficient over a period of about an hour which can be applied in the dispersion calculations of atmospheric pollutants emitted from stacks under a fumigation situation.

**40877** **APTIC NO. 63026**

Shimazaki, T. and D. J. Wuebbles

TIME-DEPENDENT TWO-DIMENSIONAL PARAMETERIZED MODEL. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 291-297. 15 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

A time dependent two dimensional model (to be applied to stratospheric ozone) is described introducing temperature, mean meridonal circulation, and eddy diffusion as the parameterized values. The two dimensional continuity equation is solved for a 360 degree meridonal plane by an alternating-direction implicit line-iterative method. The boundary conditions are given by photochemical equilibrium at the upper boundary (50 km), the same vertical flux at the lowest two grid points at the lower boundary (10 km), and a cyclic boundary condition at the side boundaries. A preliminary result of the photochemical pure-oxygen model obtained by this method is compared with recent Nimbus 4 BUV Measurements. (Author abstract modified)

**40878** **APTIC NO. 63371**

Takagi, Masumi and Tetsuji Toriyama

A SUMMARY OF OCEANIC OBSERVATIONS OF ELECTRIC FIELDS, CONDUCTIVITY, SPACE ELECTRIC LOADS, AND COAGULATION NUCLEI. *(Denjo dendodo kukan denka gyoketsu kakusu no yojo kansoku gaiho). Text in Japanese. Taiki Denki Kenkyu (Proc. Soc. Atmos. Electr. Jap.), no. 7:32-35, Aug. 1972.*

The expedition of the Tokyo Univ. Marine Research Lab. conducted an investigation of electric fields, electroconductivity, air space electric load, and coagulation nuclei counts on the Pacific Ocean between November 1971 and March 1972. The purposes of the investigation were: a study of the atmospheric electric current circuit which is relatively free of pollutants on the ocean; the question of aerosol dispersion from the land into the ocean, which is known to vary seasonally and geographically; and the question of emission of aerosols from the ocean itself. The last two questions will be used in the future for studies of background pollution of the earth by microparticles of various kinds. The analyses of data have not been completed and no conclusive answers have been obtained. Measurements are presented in graphs.

**40879** **APTIC NO. 63020**

Underwood, Robert L.

THE PERTURBED ATMOSPHERE: A REVIEW OF CIAP ACTIVITIES. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 230-236. 3 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

A review of the Major Climatic Impact Assessment Program (CIAP) activity which is structured to estimate perturbations to the 1990 stratosphere and the 1990-2020 troposphere that could result from projected 1990 world high altitude fleet operations is presented. Experimental and observational data are utilized where they can give insight into model validity or provide necessary model parameterizations. The spectrum of models necessary for estimation of the perturbed atmosphere may be categorized by the time and motion scale resolved, by model dimensionality, and by degree of coupling between fluid motions and chemistry in the model. Model intercomparisons, comparisons with observed climatology, and model sensitivity studies are essential for placing confidence levels upon model predictions. The CIAP perturbed atmosphere modeling projects are subdivided into those dealing with aircraft wake modeling; modeling of the dispersion and transport regime; global scale circulation modeling; and simplified atmospheric modeling. (Author abstract modified)

**40880** **APTIC NO. 63032**

Warshaw, Michael

THE SENSITIVITY AND COMPARISON OF GENERAL ATMOSPHERIC CIRCULATION MODELS. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 363- 368. 8 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

The use of a computer simulation of the global atmospheric circulation to answer the climatological questions posed by the Climatic Impact Assessment Program is discussed. A series of statistical tests on the data produced by simulations of the global atmosphere should be performed to ensure that observed changes in climatological variables are attributable to systematic differences in the state of the atmosphere, not merely to random excursions of the same atmospheric system. Erroneous conclusions could result from improper testing. (Author abstract modified)

**40881** **APTIC NO. 63031**

Washington, Warren M.

DEVELOPMENT OF A THREE-DIMENSIONAL STRATOSPHERIC GLOBAL CIRCULATION MODEL AT THE NATIONAL CENTER FOR ATMOSPHERIC RESEARCH. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 358-362. 7 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

Numerical experiments with the 12 layer National Center for Atmospheric Research model were performed and compared to the observed January climate to see the effect of the earths orography on simulation. The stratospheric model is a logical sequel to the earlier tropospheric version. Six 3 km layers were added to the top of the previous model which extended it from 18 km to 36 km. This addition required changing the radiation treatment so that ozone heating could be accounted for within the lower stratosphere. The remaining physical processes in the model were left unchanged. Without mountains the stratospheric patterns are nearly zonal, whereas in the most realistic mountain experiments very good agreement was obtained with observed stratospheric geographical distribution. (Author abstract modified)

## 1971

**40882** **APTIC NO. 64612**

Wessels, H. R. A. and J. A. Wisse

A METHOD FOR CALCULATING THE SIZE OF COOLING TOWER PLUMES. *Atmos. Environ., vol. 5:743-750, 1971. 8 refs.*

A method for calculating the size of cooling tower plumes and for estimating the probability of ground fogging is described along with several useful nomograms for making the calculations. The plume of the tower is described in terms of the dispersion of the enthalpy gained by the air in the tower, and a nomogram is developed to determine the length of the visible part of the plume. The conditions for which the plume reaches the ground are given in dependence of the Pasquill-stability-class and the effective source height. The theoretical model is demonstrated for a fictitious 500 MW natural draft cooling tower using meteorological data of one winter season at De Bilt, The Netherlands. About half of the plumes with lengths in excess of 200 m can reach the ground for an effective plume height of 50 m. A discussion of the article (by S. R. Hanna and S. D. Swisher) is included demonstrating that the probability of the vapor plume reaching the ground from the tower for the particular example given is much lower than suggested since the effective source is much higher than assumed in the original article.

## 1968

**40883** **APTIC NO. 64599**

Kurbatkin, V. P.

CHARACTERISTICS OF TURBULENCE IN THE SURFACE BOUNDARY LAYER IN A MOUNTAIN VALLEY IN WINTER. *Tr. Sredneaziat. Nauch-Issled. Gidrometeorol. Inst., 56(41):51-56, 1968. 9 refs. Translated from Russian by V. Mosenzeff, Air Force Systems Command, Wright- Patterson AFB, Ohio, Translation Div., Proj. 682E, FTD-HT-23-448-70, 12p., Sept. 2, 1970.*

NTIS,DDC: AD-714 754

Weather modification sets were conducted with ground-based aerosol generators in the Pskem River valley (Tien-Shan mountains). Quantitative determinations of turbulence characteristics were made, especially of the coefficient of turbulence. Gradient observations were made daily from Nov. 20, 1965 to March 10, 1966 at 700, 1000, 1300, 1600, 1900, and 2000 hr of the air temperature and winds at h equals 0.2, 0.5, 1.0, and 2.0 m. Soil temperatures were measured during the mid-winter period. The data were analyzed with the Obukhov-Monin equations and with the Monin-Kazanskiy nomogram. Ground covers (vegetation, snow), degree of cloudiness (clear or overcast), the mean monthly variations in the stability parameter, given mean values m/sec, and the maximum and minimum values of the turbulence coefficient are tabulated.

## 1966

**40884** **APTIC NO. 64534**

Djordjevic, N., W. Ehrman, and G. Swanson

FURTHER STUDIES OF DENVER AIR POLLUTION. *Colorado State Univ., Fort Collins, Dept. of Atmospheric Science, Dept. of Health, Education and Welfare Grant 5 ROI AP 00216-03, Atmospheric Science Paper 105, 152p., Dec. 1966. 41 refs.*

During the 1964-1965 and 1965-1966 winter seasons, 32 days with air pollution in Denver were studied. The selection of days was made on the basis of an established criterion which is discussed. From two-hour wind fields, a large sample of quasi-horizontal air parcel trajectories were obtained using a kinematical method. Calculations of total and local change in the pollution following the trajectories were made. This allowed the determination of the horizontal advection of the pollutant. The term which represents the vertical advection is at least one order of magnitude smaller than the horizontal transport, and was, therefore, neglected. Polluted air moved back and forth over the city in mountain and valley breezes during the days with air pollution; thus, the same contaminated air mass remained over Denver for a few days. The main sources of pollutant were located in the northeastern part of the Denver metropolitan area. The smaller sources which exist within the area could not be located by the presently applied method. Data processing machine techniques employed in this study are expalined in detail, including possible applications of these developed techniques to real time data acquisition and presentation installations. Results of microscopical analysis of suspended particulates in the Denver air are discussed. This study was a preliminary one in which to evaluate the feasibility of identification of suspended particulates in situ. The analysis relied on morphological identification and simple chemical morphological identification and simple chemical and microscopical techniques. Wind changes and inversion conditions affected the composition of the sample as well as the size distribution.

### 1964

**40885** **APTIC NO. 62927**

Page, J. K.

URBAN BIOMETEOROLOGY. THE EFFECTS OF TOWN PLANNING AND ARCHITECTURAL DESIGN ON THE MICROCLIMATIC ENVIRONMENT OF MAN. *In: A Survey of Human Biometeorology. Frederick Sargent II and Solco W. Tromp (eds.), World Meteorological Organization, Geneva (Switzerland), WMO-160.TP.78, TN 65, p. 75-84, 104-113, 1964. 217 refs.*

The general aim in urban biometeorology should be to engineer the microclimate so that man s habitat is as optimal as far as economic resources will permit. Unfortunately, the economic forces opposing this aim can be very great. The general principles in studying urban biometeorology are reviewed. The climate of towns including the temperature, wind, sunshine, and pollution can be different from the surrounding areas. Atmospheric pollution and the town itself can change the climate. The exterior and interior microclimate, the thermal microclimate in hot and cold weather, natural ventilation, sunshine, noise, and daylighting are discussed with respect to buildings. Urban life is being conducted under increasingly adverse biometeorological conditions, and considerable thought needs to be given to improving the urban environment. A great deal can be done by intelligent design of buildings to improve internal microclimate and reduce stress. Unfortuantely, since a majority of architects are not aware of biometeorological principles, their designs often fall short of the standard possible when existing knowledge is properly applied.

### 1938

**40886** **APTIC NO. 63093**

Kenrick, G. W. and H. Ortiz

MEASUREMENTS OF ULTRA-VIOLET SOLAR RADIATION IN PUERTO RICO. *Trans. Am. Geophys. Union, 1938:134-137, 1938. 8 refs.*

Preliminary measurements of ultraviolet solar radiation were made in Puerto Rico with a photoelectric cell. The equipment and its calibration are described, results are given, and a future program is outlined. The ratio of ultraviolet to total radiation was plotted and was nearly a straight line. The atmospheric transmission coefficient of the ultraviolet appeared to vary as the square of the coefficient for the total radiation. Diurnal and monthly variations of ultraviolet and total radiation, and the variation of the ultraviolet radiation against the air mass are shown in figures. The latitude caused variations because it determined the directness of the sun s rays and the air mass absorption. Other factors affecting atmospheric absorption of ultraviolet were seasonal and other changes in ozone absorption, and tropospheric and atmospheric opacity as determined by smoke, clouds, and other factors. Clear atmosphere and low cloudiness in Puerto Rico and Miami filter out less of the possible ultraviolet (as determined by air mass values) than the more polluted air of Chicago. Seasonal and diurnal variations of solar altitude and latitude affects are presented in figures.

## BASIC SCIENCE AND TECHNOLOGY

### 1974

**40887** **APTIC NO. 64448**

Beeckmans, J. M.

ANALYSIS OF MEDNIKOV S EQUATION FOR THE TRANSPORT OF AEROSOL PARTICLES ACROSS A TURBULENT BOUNDARY LAYER. *Can. J. Chem. Eng., 52(2):273-275, April 1974. 11 refs.*

Numerical solutions are presented for the problem of transport of aerosol particles across a turbulent boundary layer to an absorbing wall, using Mednikov s migration velocity mechanism in addition to molecular and turbulent diffusivity terms in the transport equation. Inclusion of the migration velocity term leads to a gross overestimate of the rate of transport at certain velocities; thus, Mednikov s expression cannot be valid in its present form. (Author abstract)

**40888** **APTIC NO. 63273**

Bemand, Peter P., Michael A. A. Clyne, and Robert T. Watson

ATOMIC RESONANCE .FLUORESCENCE AND MASS SPECTROMETRY FOR MEASUREMENTS OF THE RATE CONSTANTS FOR ELEMENTARY REACTIONS: O 3P(J) + NO2 YIELDS NO + O2 AND NO + O3 YIELDS NO2 + O2. *J. Chem. Soc., Faraday Trans. II, 70(3):564-576, 1974. 22 refs.*

New direct determinations of the rate constants k1 and k2 (cu cm/molecule/sec) were determined at 298. The constant k1 was (9.5 + or - 1.1) times 10 to the -12th power for the reaction oxygen atom + nitrogen dioxide yields nitric oxide + oxygen molecule. The constant k2 was (1.81 + or - 0.13) times 10 to the -14th power for the reaction NO + ozone yields NO2 + O2. The constant K1 was determined in two independent discharge flow systems, one using atomic resonance fluorescence to measure -dln(O)/dt, the other using mass spectrometry to measure -dln(NO2)/ dt, under pseudo first-order kinetic conditions. Additionally, k1 was measured, using atomic resonance fluorescence, at 16 temperatures from 298 to 1055 K. A small (negative) temperature coefficient occurred in this range; least mean squares analysis of the present and previous direct data for k1 lead to the expression, log10 (k1/cu cm/molecule/sec) equals (-9.758 + or - 0.136)-(0.52 + or - 0.05)log10(T/K). (Author abstract modified)

**40889** **APTIC NO. 63377**

Cadle, R. D., H. H. Wickman, C. B. Hall, and K. M. Eberle

THE REACTION OF ATOMIC OXYGEN WITH FORMALDEHYDE, CROTONALDEHYDE, AND DIMETHYL SULFIDE. *Chemosphere, 3(31):115-118, June 1974. 10 refs.*

As part of a long-term study of reactions of atomic oxygen with organic compounds in the atmosphere is investigated the kinetics of the reaction for the O(3P) (oxygen superscript 3P) with formaldehyde, crotonaldehyde, and dimethyl sulfide. The rate constant for the O(3P)-formaldehyde reaction is given by k equals 3.7 times 10 to the 12th power exp (-2400/RT) cu cm/mole sec. The rate constant for the O(3P)-crotonaldehyde reaction was somewhat greater than the rate constant for acrolein. The substitution of a methyl group for one of the hydrogens of acrolein to produce crotonaldehyde increases the rate constant. The rate constant for dimethyl sulfide is considerably smaller than that for the reaction of O(3P) with various substances definitely known to occur in the atmosphere, ethylene and propylene, for example. Dimethyl sulfide has a long lifetime in the troposphere. The small rate constant for the O(3P)- formaldehyde reaction suggests that it should be less reactive in photochemical smog than most other aldehydes and will accumulate as the smog ages, and aldehyes are generally more reactive in photochemical smog than the rate constants for the O(3P)-aldehyde reactions might suggest, possibly because these restrictions produce hydroxy radicals which are chain carriers.

**40890** **APTIC NO. 63398**

Cerruti, Luigi, Eros Modone, Eugenio Guglielminotti, and Enzo Borello

INFRA-RED STUDY OF NITRIC ACID ADSORPTION ON MAGNESIUM OXIDE. *J. Chem. Soc., 4:729-739, 1974. 35 refs.*

An infrared study of nitric oxide adsorption on high area magnesium oxide (previously degassed at 800 C) room temperature is reported. The adsorption of NO onto MgO produces infrared bands at 800-900 cm to the minus one power, 1100-1250 cm to the minus one power, and 1350-1450 cm to the minus one power. These adsorption bands were assigned to several surface species: NO2(-) ions with various configurations and NO(-) and N2O2(--) ions, coordinated to Mg(++) ions. The adsorption (3.3 times 10 to the 13th power molecule/sq cm, at 10.4 times 1000 N/sq m of NO) occurs in limited surface zones.

**40891** **APTIC NO. 64701**

Chiu, Horn-Ming, Noboru Hashimoto, and J. M. Smith

CHROMATOGRAPHIC STUDIES OF ABSORPTION OF NITRIC OXIDE ON ACTIVATED CARBON. *Ind. Eng. Chem. Fundamentals, 13(3):282-285, Aug. 1974. 3 refs.*

When pulses of nitric oxide are passed over a bed of activated carbon particles at 180 C, reversible adsorption and some adsorption that is irreversible in the effluent time of the pulse occur. When the bed is pretreated with nitric oxide, subsequent pulse tests indicate only reversible adsorption. An equation was derived for the first moment of the effluent pulse when both reversible and irreversible adsorption occur. Analysis of the NO-activated carbon data with this equation indicates that approximately 41% of the adsorption is irreversible. The techniques used should be useful in measuring the extent of irreversible adsorption on fresh adsorbents and in explaining differences in adsorption characteristics as measured by transient (pulse) and steady-state methods. (Author abstract)

**40892** **APTIC NO. 63386**

Daubendiek, Richard L. and Jack G. Calvert

THE REACTION OF OZONE WITH PERFLUORINATED POLYOLEFINS. *Environ. Letters, 6(4):253-272, 1974. 15 refs.*

Rate studies of the reaction of ozone with perfluorinated polyolefins are conducted with three different Teflon samples. The teflons react with ozone to generate carbonyl difluoride among other products, with the reaction rate being directly proportional to ozone concentration and increasing with Teflon surface area for a given ozone concentration. The mechanism appears to involve a Teflon surface reaction between O3 and a terminal olefinic bond in the polymer. The use of Teflon laboratory equipment with ozone containing mixtures should be cautioned by the possible complications of CF2O formation. (Author abstract modified)

**40893** **APTIC NO. 64700**

Davis, E. James and Edward Chorbajian

THE MEASUREMENT OF EVAPORATION RATES OF SUBMICRON AEROSOL DROPLETS. *Ind. Eng. Chem. Fundamentals, 13(3):272-277, Aug. 1974. 24 refs.*

Evaporation rates of single submicron dioctyl phthalate aerosol droplets were measured using laser light scattering from droplets suspended in a Millikan cell. Results at atmospheric pressure were in good agreement with the Maxwell equation for diffusion- controlled evaporation. The experimental method should be applicable to measure evaporation rates of very small droplets in the free-molecule and intermediate Knudsen aerosol regimes. (Author abstract)

**40894** **APTIC NO. 64964**

Djamgouz, O. T. and S. A. A. Ghonein

DETERMINING THE PICK-UP AIR VELOCITY OF MINERAL DUSTS. *Can. Mining J., vol. 7:25-28, July 1974. 10 refs.*

Determination of the pick-up air velocity for mineral dust within a specific gravity range of 1.42 to 2.7 and particles ranging in diameter from 10 to 105 microns was performed. The consequent results are shown for dusts in dry state (0% water) and for dusts in the semi-dry state (5-10% water by weight). As expected, coarser and heavier particles (75-105 micron range) require higher flow rates to be picked up and the maximum pick-up air velocity is indicated at 1450 fpm. Samples taken were representative at this velocity and all size ranges of particles were counted under the microscope. The coal dust, which has the smallest specific gravity, needed 1040 fpm air velocity to be picked up. The pick-up velocity of particles decreased proportionally to the size of the particles. The maximum pick-up air velocity has increased to 1660 fpm and for coal dust it has increased to 1240, which is equivalent to the dry state silica dust pick-up velocity. The same can be said for semi-dry silica dust. Fine dust particles have a tendency to absorb more moisture while they are in the same environment as the coarser ones. Therefore, moist fine particles require a higher percentage of flow rate than the coarser ones in order to be picked up. (Author conclusions)

**40895** **APTIC NO. 63245**

Dudyrev, A. N., M. I. Shutova, and G. G. Nizhnikov

ADSORPTION OF TOXIC GASES BY SUSPENDED MINE DUST. *(Sorptsiya yadovitykh gazov vitayushchey rudnichnoy pyl yu). Text in Russian. Gorn. Zh., no. 2:64-65, 1974. 2 refs.*

The adsorption of toxic gases (such as nitrogen oxides and carbon monoxide, formed during explosions in mines) on suspended and settling dust particles was studied. Suspended dust samples collected 15 min after detonation contained 0.34-0.4 mg CO and 1.73-1.77 mg nitrogen oxides per g, while settled dust contained 0.0048 mg CO and 0.0407 mg nitrogen dioxide per g in cases without the exhaust system in operation. The adsorption was facilitated by the high specific surface of the suspended dust particles, and easily condensing gases were most readily adsorbed. The adsorbed gases increase the fibrogenicity of the inhaled dust particles.

**40896** **APTIC NO. 64943**

Duishenov, E. D., Z. T. Tekenov, G. A. Serebryakov, and A. D. Zimon

INVESTIGATION OF THE ADHESION OF PARTICLES IN THE AIR FLOW. *(Issledovaniye adgezii chastits v vozdushnom potoke). Text in Russian. Kolloidn. Zh., 1974:544-546, 1974. 4 refs.*

The detachment of spherical glass and loess particles from steel and lead surfaces in an air flow was studied in an open wind tunnel. A formula for the determination of the mean air velocity of detachment was found. The mean critical velocity of detachment decreased linearly with increasing particle size in a range of 0-200 micron per both glass and loess particles. The mean critical velocity was lower for spherical, less-adhering glass particles than for adhesive loess particles with an irregular shape, and it also decreased with decreasing surface roughness.

**40897** **APTIC NO. 63318**

Fenimore, C. P. and John Moore

QUENCHED CARBON MONOXIDE IN FUEL-LEAN FLAME GAS. *Combustion Flame, 22(3):343-351, June 1974. 8 refs.*

The quenching of carbon monoxide in fuel-lean flame gas was investigated. Laminar sheets of ethylene air primary flames and of additional cooling air were interleaved to get a very lean gas of low mean temperature. At mean temperatures below a ceiling (of about 1250 K at atmospheric pressure) a few hundred to a few thousand ppm of CO were quenched at the boundaries of fuel lean flame and persisted unreacted for many milliseconds in the mixed gas-the more CO being quenched the cooler and the thinner the flame sheets. Little CO was quenched at the hotter boundaries of fuel-rich flame sheets, whatever the mean temperature of the mixed gas. The observations are consistent with the approximation that all the flame-generated trace species except CO (hydrogen atom, oxygen atom, hydrogen molecule, and hydroxyl radical) remain equilibrated among themselves and decay together, but CO is not necessarily equilibrated with the others. Because its rate of reaction with OH can be slow compared to the decay of the other trace species, CO can remain largely unreacted as the others decay. (Author abstract modified)

**40898** **APTIC NO. 63263**

Flagan, Richard C., Serge Galant, and John P. Appleton

RATE CONSTRAINED PARTIAL EQUILIBRIUM MODELS FOR THE FORMATION OF NITRIC OXIDE FROM ORGANIC FUEL NITROGEN. *Combustion Flame, 22(3):299-311, June 1974. 23 refs.*

Rate constrained partial equilibrium models which describe the formation of nitric oxide from organic fuel nitrogen during combustion were developed. Predictions of model calculations for the combustion of hydrocarbon fuels, which contain organic nitrogen in forms typical of those found in naturally occurring fossil fuels, appear to be in good agreement with the NO yields measured in recently reported premixed flame experiments. (Author abstract modified)

**40899** **APTIC NO. 64863**

Geldblatt, Maxwell and Berthus B. McInteer

HIGHLY ENRICHED MULTIPLY-LABELED STABLE ISOTOPIC COMPOUNDS AS ATMOSPHERIC TRACERS. *(United States Atomic Energy Commission, Washington, D. C.) U. S. Pat. 3,788,814. 2p., Jan. 29, 1974. 3 refs. (Appl. Feb. 1, 1972, 4 claims).*

This invention relates to a method of tracing labeled compounds at high dilutions and more particularly to the use of compounds multiply-labeled with stable isotopes as tracers. For example, 13C1802 provides a useful tracer for following atmospheric pollution produced as a result of fossil fuel burning. Compounds which are singly labeled with stable isotopes are exceedingly difficult to detect at high dilutions such as normally prevail in the atmosphere. The method is not limited to atmospheric tracing but may be applied to any situation in which the labeled compound will be highly diluted. (Author abstract)

**40900** **APTIC NO. 64811**

Grams, G. W., I. H. Blifford, Jr., D. A. Gillette, and P. B. Russell

COMPLEX INDEX OF REFRACTION OF AIRBORNE SOIL PARTICLES. *J. Appl. Meteorol., 13(4):459-471, June 1974. 33 refs.*

The angular variation of the intensity of light scattered from a collimated beam by airborne soil particles and the size distribution of the particles were measured simultaneously 1.5 m above the ground. The measurements gave an estimate of the complex index of refraction of airborne soil particles equal to the real part minus the imaginary part of the refractive index. Standard microscopic analysis procedures were employed to determine the real part of the refractive index. Although a wide range of values was observed, the value of 1.525 was taken as representative. By applying Mie scattering theory to each of the observed distributions of particle size, the expected angular variation of the intensity of the scattered light was calculated for a fixed value of the real part of the refractive index and a wide range of values of imaginary refractive index. For each set of simultaneous measurements, the value of the imaginary part of the refractive index was that value which provided the best fit to the experimental data. The upper limit of the value of the imaginary part of the refractive index for the airborne particles studied was 0.005 with an uncertainty factor of about two. The estimate of the imaginary part was fairly insensitive to the assumed value of the real part of the refractive index. (Author abstract modified)

**40901** **APTIC NO. 64713**

Greenspan, Donald

AN ARITHMETIC, PARTICLE THEORY OF FLUID DYNAMICS. *Comput. Methods Appl. Mech., 3:293-303, 1974. 16 refs.*

A new, deterministic approach to the theory of fluid behavior is presented which is of such generality that both laminar and turbulent flows will correspond merely to different degrees of flow irregularity. The model is computer-oriented. A fluid will be thought of as consisting of a finite number of particles. The motion of these particles will be determined by dynamical difference equations, or, in effect, by recursion formulas, and the difference equations will be solvable in a constructive fashion by means of modern digital computers. Not only will this high-speed arithmetic approach be simpler and more comprehensive than the specialized methods developed by Lax, Popov, and Samarskii, who neglect both viscosity and heat conduction, but it too will be conservative. Laminar and turbulent flow are treated in a unified fashion and computer examples are given to illustrate a mechanism for transition from a laminar to a turbulent state.

**40902** **APTIC NO. 64858**

Harcourt, Richard D. and David P. Kelly

VALENCE FORMULAS FOR C2H3NO5--PAN OR APN? *Environ. Sci. Technol., 8(7):657-676, July 1974. 18 refs.*

Valence formulas for C2H3NO5 are discussed, and a structure is proposed. There is doubt as to whether the compound is peroxyacetyl nitrate (PAN formed by NO2 and peracetyl or if it is acetylpernitrate (APN) formed by nitrate and acetyl. Because the Pauling electronegativities of nitrogen and oxygen atoms are not very different, stable valence formulas should have small formal charges on these atoms when they are adjacent in neutral molecules. Based on this assumption, it is demonstrated how simple bonding theory for RONO3 (R double bond CH3CO) suggests that the molecule is better formulated as PAN rather than APN.

**40903** **APTIC NO. 63198**

Iwaizumi, Masamoto, Shozo Kubota, and Taro Isobe

AN ESR STUDY OF NITRIC OXIDE ADSORBED ON SILICA GEL. *Bull. Chem. Soc. Japan (Tokyo), 47(3):597-599, March 1974. 13 refs.*

Nitric oxide adsorbed on silica gel was investigated by ESR (electron spin resonance). There were at least two adsorption sites for nitric oxide; one of them is on the silica gel which has been pretreated at low temperatures (below 500 C) (Site L), while the other is predominantly on the silica gel which has been pretreated at high temperatures (above 500 C) (Site H). The crystal-field splitting of the pi sub X asterisk and pi sub Y asterisk states, which are originally degenerate, was 0.26 eV for the NO adsorbed on Site L and 0.52 eV for the NO on Site H. The temperature dependence of the ESR spectrum was also examined, and the average crystal field acting on NO decreased with an increase in the temperature. (Author abstract modified)

**40904** **APTIC NO. 63352**

Jonas, Leonard A. and Joseph A. Rehrmann

THE RATE OF GAS ADSORPTION BY ACTIVATED CARBON. *Carbon, 12(1): 95-101, April 1974. 10 refs.*

The rate of gas adsorption by activated carbon was studied in terms of the functional dependence of the pseudo first order adsorption rate constant. Benzene was used as the adsorbate vapor and a packed bed column of a Pittsburgh activated carbon as the adsorbent. Benzene at a concentration of 2 times 10 to the minus 6 power g/cu cm, equivalent to a relative pressure of 0.005 at 25 C, was flowed into the carbon bed at superficial linear velocities ranging from 2 to 50 cm/sec. The time at which 1% of the inlet concentration appeared in the exit stream of the bed was the breakpoint time. By applying the

Wheeler adsorption kinetic equation to the experimental plot of breakpoint time versus bed weight pseudo first order adsorption rate constants at various linear velocities were determined. Using a presumed mathematical model and an overdetermined set of six equations, the Univac 1108 computer provided the coefficients for an expression showing the dependence of the adsorption rate constant on the linear flow velocity.

**40905** **APTIC NO. 63285**

Kato, Kozo, Chikatoshi Kurata, Kenji Mori, and Kenichi Fujii

FORMATION OF FUEL NITRIC OXIDE AND ITS ATTENUATION METHODS (IV). *(Fuel NO no seisei to sono teigenho ni tsuite (dai4ho)). Text in Japanese. Preprint, Japan Society of Mechanical Engineers, Kansai Branch, p. 71-74, 1974. 7 refs. (Presented at the Japan Society of Mechanical Engineers, Kansai Branch Meeting, 49th, March 19-20, 1974, Paper 3411.)*

Using hydrogen and premixed flames, the nitric oxide formation mechanism of dispersion flames were studied. A glass combustion tube with a 64 mm diameter and a 900 mm height was used. The fuel gas was jet injected from a 2 mm nozzle. Methane gas was also used for a contrast. If 1% of the fuel s nitrogen is converted into NOx, the theoretical formation of NO is 1340 ppm with methane and 1520 ppm with hydrogen flame. The NO formation quantity changed greatly with the hydrogen dispersion flame depending on the air supply into the flame. The NO increased greatly when excess air was supplied and the combustion condition was close to the premixture. The NO formation process could be explained by regarding N2 as changing into the N atom and by expanding the Zeldovich mechanism. With an increase of N2 in the fuel, occasionally the NO emission quantity decreased. The important reaction in this case was N + NO changing to N2 + O. The NO was mostly formed in the center of the flame when the air was mixed in the flame.

**40906** **APTIC NO. 63174**

Kaye, Wilbur

LIQUID-PHASE PARTICULATE CONTAMINANTS IN WATER. *J. Colloid Interface Sci., 46(3):543-544, March 1974. 11 refs.*

The contamination of high-purity water by organic constituents in the atmosphere is considered in terms of the nature of the process, particulate composition, and particulate removal methods for subsequent trace analysis and particle classification. Hydrocarbons appear to be the most likely source of the particles. They apparently collect on the surface of the quiescent distillate and are rare in the water withdrawn from below the surface. Bubbles breaking through this surface or drops falling into it suffice to break the film and disperse it into droplets that remain dispersed indefinitely. A method is described for considerably reducing the particle count in water by distillation in a quartz still modified to permit collection of water with very little agitation of the distillate surface.

**40907** **APTIC NO. 63162**

King, Frank W.

TAKING H2S FROM LIQUID SULFUR--WHY AND HOW. *Oil Gas J., 72(2):164-165, June 3, 1974. 4 refs. (Presented at the Canadian Gas Processors Association, Calgary, Alberta, Nov. 30, 1973.)*

A degasification process for producing liquid sulfur with 5 ppm hydrogen sulfide is described. High concentrations of H2S increase the risk of explosions during transportation and handling. The process was developed by the Soc. Nationale des Petroles d Aquitaine (SNPA) in France and is based on cooling and agitation. Liquid sulfur is recirculated through huge spray nozzles and into a receiving pit or tank. Small quantities of ammonia are injected upstream of the pump to catalyze the decomposition reaction and shorten the cycle time required to reach 5 ppm. The original SNPA process is a batch process which requires a separate pit or tank for degassing. Modified versions are available in both Alberta and the United States. Complete understanding of the H2S-S solubility relationship is hampered by lack of reliable plant measurement techniques. Several laboratory analytical techniques were developed, but they are not always practical for plant operations.

**40908** **APTIC NO. 63250**

Leonov, V. T., V. F. Marchenkov, and N. S. Torocheshnikov

CATALYTIC OXIDATION OF NITRIC OXIDE. *(Kataliticheskoye okisleniye okisi azota). Text in Russian. Khim. Prom., no. 2:121-122, 1974. 7 refs.*

The kinetics of the catalytic oxidation of nitric oxide were studied in a concentration range of 1-7% by volume, in a temperature range of 60-300 C, and under 1-8 atm pressure. Palladium catalyst type APK-2 was used for the experiments. The rate of NO oxidation increased with the NO concentration up to 3.5-4% by volume, after which it decreased with increasing concentration, especially under high pressure. An increase in pressure from 1 to 8 atm caused the rate of oxidation to increase by 50%. Reduction of the rate of oxidation with increasing temperature was observed.

**40909** **APTIC NO. 64873**

Lim, C. J. and Kishan B. Mathur

RESIDENCE TIME DISTRIBUTION OF GAS IN SPOUTED BEDS. *Can. J. Chem. Eng., 52(2):150-155, April 1974. 16 refs. (Presented at the American Institute of Chemical Engineers-Canadian Society of Chemical Engineers, Joint Conference, 4th, International Symposium on Spouted Beds, Vancouver, British Columbia, Sept. 9-12, 1973.)*

Stimulus-response experiments were carried out, using helium gas as a tracer, to measure the residence time distribution of gas in spouted beds. The data obtained under a variety of experimental conditions was compared against predictions from a two-region gas flow model. The model postulates plug flow of gas in the spout and axially-dispersed plug-flow in the annulus, the extent of axial dispersion being accounted for by a coefficient, D, which is an adjustable parameter of the model. The values of D increased with the gas flow rate, were relatively insensitive to bed path, and were much larger for beds of wheat than of polystyrene. (Author abstract)

**40910** **APTIC NO. 64874**

Littman, H., D. V. Vukovic, F. K. Zdanski, and Z. B. Grbavcic

PRESSURE DROP AND FLOWRATE CHARACTERISTICS OF A LIQUID PHASE SPOUT-FLUID B AT THE MINIMUM SPOUT-FLUID FLOWRATE. *Can. J. Chem. Eng., 52(2):174-179, April 1974. 10 refs. (Presented at the American Institute of Chemical Engineers-Canadian Society of Chemical Engineers, Joint Conference, 4th, International Symposium on Spouted Beds, Vancouver, British Columbia, Sept. 9-12, 1973.)*

Data are presented on the minimum spout-fluid flow rates and the pressure drop in the annulus at that flow rate as a function of bed height and nozzle diameter for a bed spout fluidized with water. The spout-fluid bed combines fluidization and spouting into a single unit. The column was 62.6 mm in diameter and contained 3.09 mm of glass particles. The particle Reynolds number at the minimum fluidizing velocity was 91.6. A plot of the annular versus the nozzle flow rate showed that the minimum spout-fluid flow rates fell on a straight line between the minimum fluidizing and minimum spouting flow rates. The annular pressure drop is explained using an extension of the theory of Mamuro and Hattori. (Author abstract modified)

**40911** **APTIC NO. 63271**

Mori, Yasuo, Kazutomo Otake, and Ken Nakamura

STUDIES ON THE FORMATION AND BEHAVIOR OF NITROGEN MONOXIDE IN COMBUSTION REACTION -- BASED ON ONE-DIMENSIONAL FLAME (NO. 1). *(Nensho hanno ni tomonau issankachisso no seisei to kyodo ni kansuru kiso kenkyu). Text in Japanese. Preprint, the Japan Society of Mechanical Engineers, Tokyo, p. 21-24, 1974. 4 refs. (Presented at the Japan Society of Mechanical Engineers General Meeting, Tokyo, Japan, April 2-4, 1974, Paper 906.)*

The reaction mechanisms and kinetics of nitric oxide were studied in a one-dimensional butane-oxygen-air flame. The burner port and combustion chamber are designed to prevent rapid lowering of the combustion temperature and to isolate the combustion gas from the open air. The NO was analyzed by chemiluminescence, and the results compared with those obtained by the Saltzman and redox potential methods. An accurate method of measuring the temperature of the combustion gases was established, and the behavior of NO formation agreed well with theoretical calculations.

**40912** **APTIC NO. 63370**

Mostecky, Jiri, Vladimir Hlavacek, and Jaroslav Votruba

THE OXIDATION OF CARBON MONOXIDE IN THE LIGHT OF EXPERIMENTS MADE WITH AN ALVEOLAR PIPE CATALYST. *(Experimentalstudie der Kohlenmonoxidoxidation an einem, Wabenrohrkatalysator). Text in German. Erdoel Kohle - Erdgas - Petrochemie, 27(5):261-264, May 1974. 29 refs.*

Experiments were performed to measure the pressure loss and the characteristics of the oxidation of carbon monoxide by oxygen over an alveolar pipe catalyst. The pressure loss is approximately 2 powers of ten lower than in a porous bulk catalyst of equal length. The range of occurrence of multiple states during exothermic catalytic oxidation within the alveolar pipe catalyst was determined. Multiple stationary conditions were measured on the alveolar pipe catalyst for strongly exothermic chemical reactions (in this case the oxidation of CO on an oxide and platinum catalyst).

**40913** **APTIC NO. 61593**

Murayama, Tadashi and Toichi Hayakawa

A EXPERIMENTAL STUDY ON A DIESEL EXHAUST ODOR. *(Dizeru kikan no haikishu ni kansuru kenkyu). Text in Japanese. Hokkaido Daigaku Kogakubu Kenkyu Hokoku (Bull. Fac. Eng., Hokkaido Univ.), no. 70:1-12, Feb. 1974. 7 refs.*

The relationship between the diesel engine operating conditions and emitted aldehydes was investigated to determine the cause of odors. A direct relationship was established between the two. The formation of exhaust aldehydes and unburned hydrocarbons are especially influenced by the excess air factor, the injection timing, and the temperature of the cooling water.

**40914** **APTIC NO. 64875**

Nagarkatti, A. and Asok Chatterjee

PRESSURE AND FLOW CHARACTERISTICS OF A GAS PHASE SPOUT-FLUID BED AND THE MINIMUM SPOUT-FLUID CONDITION. *Can. J. Chem. Eng., 52(2):185-195, April 1974. 9 refs. (Presented at the American Institute of Chemical Engineers-Canadian Society of Chemical Engineers, Joint Conference, 4th, International Symposium on Spouted Beds, Vancouver, British Columbia, Sept. 9-12, 1973.)*

Spoutfluidization is a new technique for solid-fluid contact which aims at incorporating the advantages of spouted bed and fluidized bed techniques. This technique was studied theoretically and experimentally. The characteristics of the physical state of the bed with the variation of the variables which include flow of fluid, particle diameter, orifice diameter, and bed height were studied. Minimum spoutfluidizing velocity was studied using glass beads with mean particle diameters from 0.254 to 0.600 mm in a 90 mm glass column with three spouting inlet orifice sizes at different bed heights. Phase diagrams indicated that the minimum spout-fluid flow rate in a gas-solid system may be a point property for a given bed. A correlation is presented in which the standard deviation of experimental from calculated minimum spoutfluidizing velocity is within 5%. (Author abstract)

**40915** **APTIC NO. 63287**

Narain, J. P. and M. S. Uberoi

THE SWIRLING TURBULENT PLUME. *J. Appl. Mech., 41(2):337-342, June 1974. 14 refs. (Presented at the American Society of Mechanical Engineers, Winter Annual Meeting, Detroit, Mich., Nov. 11-15, 1973, Paper 73-WA/APM-23.)*

An entrainment model for an axisymmetric buoyant swirling turbulent plume in a quiescent homogeneous density surrounding medium was developed. The streamwise similarity of the mean axial velocity, swirl velocity, turbulent Reynolds stresses, and the density difference between the plume and the ambient fluid are assumed. Consistent with various integrated conservation equations, the entrainment is a function of the Reynolds stress, the form of various similarity profiles, the local densimetric Froude number, and the swirl ratio of the swirling plume. While the swirl alone always increases the rate of entrainment across the boundaries of the plume, it also interacts with the buoyancy forces to cause a slight detrainment of the fluid from the plume. The numerical results for the decays of axial and swirling velocities and the spread of the jet agree reasonably well with the existing experimental investigations. (Author abstract)

**40916** **APTIC NO. 64641**

Neshev, N. M., A. A. Andreev, and D. M. Shopov

QUANTUM CHEMICAL STUDY OF INTERACTION OF CO AND NO WITH SURFACE OF METAL OXIDES OF THE FIRST TRANSITION SERIES. *Dokl. Bolg. Akad. Nauk, 27(4):519-521, 1974. 11 refs.*

The interaction of carbon monoxide and nitric oxide with oxides of metals of the first transition series was studied on the basis of a model of the oxide crystal which was successfully applied in a study of the interaction of other adsorbates with oxide surfaces. The main feature of this model was the assumption that a pure ion bond exists in the oxide crystal. The interaction between the valence electrons of the oxygen and carbon (nitrogen) atoms of the CO (NO) molecule and the d-electrons of the metal cation was studied for a number of oxides. The adsorption was assumed to occur in linear form on a metal cation of the face of a perfect oxide crystal with an edge size of 400 A. The stability of the surface complex strongly depended on the electronic structure of the metal cation. The heats of adsorption of CO on nickel, chromium, cobalt, and iron ioxide were respectively 26, 29, 21.5, and 11.7 ccal/mol. Heats of adsorption of NO on iron and chromium oxides at a low degree of surface coverage were on the same order and the difference was negligible. One of the important characteristics of the adsorbed CO and NO was their reactivity. The calculated bond populations of the C-O and N-O bonds were used to analyze the reactivity. From the molecular orbitals diagram and from the distribution of electronic densities, it was concluded that the 5 sigma and 2 pi orbitals in CO and NO had an antibonding character. The results of the calculations also permitted interpretation of data on the infrared spectra of CO and NO adsorbed on the oxides. The experimental facts connected with the adsorption and catalysis of CO and NO on oxide catalysts were explained on the basis of theoretical considerations.

**40917** **APTIC NO. 63344**

Otoo, K., R. A. Dalla Betta, and H. C. Yao

A LABORATORY METHOD FOR THE SIMULATION OF AUTOMOBILE EXHAUST AND STUDIES OF CATALYST POISONING. *J. Air Pollution Control Assoc., 24(6):596-600, June 1974. 2 refs.*

The expected use of catalytic converters on automobiles to meet the legislated automotive emission standards makes desirable a laboratory method that permits realistic testing of these catalysts. Such a method should be versatile enough to simulate a wide range of conditions which are applicable for catalysts designed to oxidize hydrocarbons and carbon monoxide, or to reduce nitric oxide, as the case may be. For this purpose, a modified pluse-flame combustor was designed. The output of this simulator very closely resembles engine exhaust with respect to composition, space velocity, and contaminants. The durability of a monolithic or pelleted catalyst can be evaluated by long-term exposure to the simulated exhaust and by periodic measurement of the catalyst activity as a function of temperature. The apparatus and the range of conditions that can be achieved are described in detail. Poisoning of a platinum catalyst by fuels containing low concentrations of lead was studied with this exhaust simulator and compared with results obtained in engine dynamometer tests; a satisfactory correlation of catalyst deterioration was established. (Author abstract modified)

**40918** **APTIC NO. 63266**

Rush, James H. and Herman Krier

BURNING OF FUEL DROPLETS AT PRESSURES GREATER THAN ATMOSPHERIC. *Combustion Flame, 22(13):337-382, June 1974. 11 refs.*

The pressure effects on the burning in air of large hydrocarbon fuel droplets was investigated. The traditional quasi-steady analysis fails to predict any pressure dependence of the burning rate, except a very minimal amount due to nonuniform gas properties. The burning rate of liquid droplets is dependent on the ambient pressure in the range from 1-20 atm. An equation was developed which incorporates a pressure effect when the variation of the flame standoff distance with pressure is given. The pressure effect on the burning rate constant, K, appears to be small. The power law relationship is proportional to p superscript.14 for ethanol and p superscript.11 for n-propanol. (Author abstract modified)

**40919** **APTIC NO. 64841**

Sano, Hiroshi

PURSUIT OF SOURCES OF NITROGEN OXIDES. *(Chisso sankabutsu hasseigen no tsuikyu). Text in Japanese. Nenryo Oyobi Nensho (Fuel and Combustion), 41(5):411-415, May 1974. 5 refs.*

Nitrogen oxides are emitted by low temperature reducing flames, high temperature oxidizing flames, and low temperature oxidizing flames in the combustion of fuels. Low temperature reducing flame, occur when the air/fuel ratio is low for air and the fuels crystallize the carbon and nitric oxide is formed. High temperature oxidizing flames cause rapid combustion of gases such as ethylene, methane, hydrogen, and carbon monoxide which are produced by the low temperature reducing flames and high temperature reducing flames, thus accelerating the formation of NO. The low temperature oxidizing flame also contributes to the formation of NO when there are many carbon particles present. The high temperature reducing flame, however, forms less NO and decomposes even the fuel NO. The formation of NO affected high temperature, the partial pressure of oxygen, and carbon particles. Methods of repressing nitrogen oxides can be classified and evaluated on the effectiveness of these three effects.

**40920** **APTIC NO. 64887**

Senten, J.R.

GENERAL PROBLEMS OF NITROGEN OXIDES. *(Stikstofoxiden. Algemen probleemstelling). Text in Dutch. Ingenieursblad, 43(10:303-310, 1974. 45 refs.*

Studies on the formation, photochemical and other reactions, and the effects of nitrogen oxides are reviewed. Nitric oxide is formed at temperatures over 1093 C, and may be converted into nitrogen dioxide. Combustion-generated flue gases may contain high concentrations of NO as the reaction time in the flame is too short for its oxidation to NO2. The NO2 formation in the atmosphere is due to the oxidation of NO by native or molecular oxygen, ozone, or nitrates. On the other hand, NO2, absorbing ultraviolet light, is decomposed to NO and native oxygen. In the presence of hydrocarbons, NO is photochemically oxidized [illegible] NO2, and aldehydes are obtained. Peroxyacyl nitrates are formed in the presence of NO2 and oxygen. The respective shares of transportation, domestic heating, industry, and power plants in the total nitrogen oxides emission are estimated at 10%, 15%, 40%, and 35%. Studies of the nitrogen oxides concentraton variations revealed that the NO peaks are followed by ozone peaks at a time lag of 3-5 hr. Increasing light intensity entails an increase of the NO2 concentrations which peak 2 to 4 hr after the NO concentrations. Some 90% of the NO2 are photolytically decomposed in a wavelength range of 300-370 nanom. Respiratory troubles in humans, and plant damages in the form of reduced photosynthesis, loss of foliage, and increased chlorophyll content in plants were pinpointed as the effects of NO2 and NO, of which the latter was found to be less toxic for humans.

**40921** **APTIC NO. 60388**

Simonaitis, R. and Julian Heicklen

REACTION OF HO2 WITH NO AND NO2. *J. Phys. Chem., 78(7):653-657, March 28, 1974. 10 refs.*

The kinetics and mechanism of the reaction of HO2 radicals with nitric oxide and nitrogen dioxide were studied at 25 C. The HO2 radicals were prepared by the photolysis of nitrous oxide at 2139 A in the presence of oxygen and excess hydrogen. Nitrogen dioxide pressure dropped with a quantum yield of disappearance just under 2.0 until a final steady-state value was reached; and, if the irradiation was terminated, the NO2 pressure rose due to the heterogeneous decay of nitrous acid and O2. The initial decay of NO2 was caused by the reaction of HO2 plus NO2 going to HONO and O2, and the reaction was so fast that there was no evidence for the competing reaction of 2HO2 going to hydrogen peroxide and oxygen. Small amounts of both NO and NO2 present in the mixtures of N20, O2, CO and excess H2 allowed for a pressure rise in NO2 when irradiation was initiated because of the reaction of HO2 plus NO going to the hydroxy radical and NO2. The NO2 pressure passed through a maximum and then decayed with a quantum yield of about 2.0 when the NO was essentially exhausted. (Author abstract modified)

**40922** **APTIC NO. 64663**

Solymosi, Frigyes and Janos Kiss

SNO2-CR2O3 AS A CATALYST FOR THE LOW-TEMPERATURE REDUCTION OF NITRIC OXIDE. *Chem. Commun., no. 13:509-510, July 3, 1974.*

Stannic oxide containing a small amount of chromic oxide was a very active catalyst for the adsorption and reduction of nitric oxide with carbon monoxide, hydrogen, and ethylene at low temperatures during an experiment testing the adsorption of NO on SnO2. The rate of adsorption of NO was almost 10 times higher at 100 C than at 400 C. The study of the electronic interaction between SnO2 and NO indicated at least two kinds of adsorbed NO. (Author summary modified)

**40923** **APTIC NO. 64784**

*Suzuki, Shin*

*PHOTOCHEMICAL SMOG FORMATION AND REACTION. (Kokagaku sumoggu seisei hanno). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 3(7):474-489. July 1974. 33 refs.*

The photochemical reactions of air pollutants are discussed. The typical components in smoggy air and their concentrations are: nitrogen oxides, 20 pphm; ammonia, 2 pphm; hydrogen, 50 pphm; carbon monoxide, 4000 pphm; ozone, 50 pphm; methane, 250 pphm; high paraffins, 25 pphm; high olefins, 25 pphm; ethane, 50 pphm; ethylene, 25 pphm; benzene, 10 pphm; aldehydes, 60 pphm; and sulfur dioxide, 20 pphm. Naturally occurring nitric oxide was about 500 million tons per year while artificial NO was 53 million tons, with more than 95% of the latter formed in the northern hemisphere. The concentrations of nitrogen dioxide and O3 increased and those of NO and isobutene decreased as the irradiation time increased. At room temperature, 1000 ppm of NO mixed with 20 to 50% air gives 20 to 40 ppm of NO2 in a minute. At high temperature, the air pollutant increases remarkably. The time required to reach a maximum concentration of O3 almost doubles as the amount of radiation is reduced by half. The concentration of non-methane hydrocarbon must be kept below 0.16 ppm, (or 0.11 ppm in a different study in order to keep the concentration of O3 below 0.10 ppm.

**40924** **APTIC NO. 63196**

Tsang, W.

A SIMPLE TECHNIQUE FOR THE GENERATION OF DILUTE MIXTURES OF POLLUTANT GASES. *J. Res. Natl. Bur. Std. -A., 78A(2):157-162, March-April 1974. 5 refs.*

The pyrolysis of compounds whose decomposition produces equal numbers of reactive and stable molecules provides a simple quantitative means of generating dilute mixtures of formaldehyde, acetaldehyde, and acrolein. The requirements with respect to the thermal stability of such parent compounds are discussed, and the possible extensions to other reactive gas systems are considered. The capability of generating accurately known dilute mixtures of reactive gases is important for the quantitative understanding of air pollution chemistry. For example, such mixtures are needed in the calibration of measuring instruments, in toxicity investigations, and in physicochemical studies on the rates and mechanisms of pollutant formation. (Author abstract modified)

**40925** **APTIC NO. 64658**

Valitov, N. K., F. K. Ibragimov, and V. M. Lysikov

THERMAL DESORPTION OF SO2 FROM THE SURFACE OF VANADYL SULFATE CATALYSTS. *(Termodesorptsiya SO2 s proverkhnosti sulfovanadiyevodo katalizatora). Text in Russian. Zh. Prikl. Khim., 47(5):1142-1144, May 1974. 6 refs.*

The thermal desorption of adsorbed sulfur dioxide from the surface of an SVS vanadyl sulfate catalyst was studied by thermochromatographic method. Following adsorption in a temperature range of 470-540 C, thermal desorption was conducted at rising temperatures from 470 C to 590 C. A linear increase in the thermodesorption peak temperature with the increase of the adsorption temperature was established. The rate of SO2 saturation decreased considerably with rising temperatures (from 0.4-0.45 at 470 C to 0.1 to 540 C).

**40926** **APTIC NO. 64831**

Vulis, L. A. and L. P. Yarin

THE STRUCTURE AND DESIGN OF DIFFUSION TORCHES. *(Struktura i raschet diffuzionnogo fakela). Text in Russian. Fiz. Goreniya Vzryva, no. 2:151-161, 1974. 21 refs.*

The calculation and factors influencing the geometry of the flame of diffusion torches are presented. At infinitely high reaction rates, the reagent concentration in the flame front is assumed to be zero, and the temperature equals the adiabatic combustion temperature. The presence of a centralized heat source in the form of the flame front leads to a considerable change in the temperature and concentration distribution in the torch with respect to inert gas flows. For a first approximation, the inner zone of the torch can be regarded as a zone where the mixing of the heavy gas jet (fuel) with lighter gases (combustion products) takes place, while the outer zone can be regarded as such in which the lightweight gas jet is flowing into an atmosphere of a denser gas (oxidizing gas). Equations for the determination of the length and configuration of the torch and of the distribution of the characteristics over the entire flow field are given. The increase of the fuel concentration leads to considerable flare-up and elongation of the torch, while an increase in the oxidizing gas concentration in the surrounding space leads to a constriction of the torch. Rapid constriction of the flame with increasing initial temperature of the fuel, and considerable flare-up of the flame with increasing initial temperature of the oxidizing gas were determined. The site of the flame front, and both the length and shape of plane and symmetric turbulent torches are determined by the physicochemical characteristics of the initial reagents and combustion parameters.

**40927** **APTIC NO. 63315**

Yalamov, Y. I., O. A. Barsegyan, V. S. Galoyan, and B. V. Deryagin

ON THE THEORY OF THE MOTION OF MODERATELY LARGE NON-VOLATILE AEROSOL PARTICLES IN A BINARY GAS MIXTURE WITH INHOMOGENEOUS TEMPERATURE AND CONCENTRATION DISTRIBUTION. *(K teorii dvizheniya umerenno krupnykh neletuchikh aerozol nykh chastits v neodnorodnoy po temperature i kontsentratsii binarnoy gazovoy smesi). Text in Russian. Dokl. Ak[illegible]. Nauk SSSR, 216(2):289-292, 1974. 12 refs.*

A mathematical theory of the motion of moderately large nonvolatile aerosol particles in a binary gas mixture with an inhomogeneous temperature and concentration distribution is presented. A formula describing the total force acting upon the aerosol particles is derived for the determination of relative velocity of the particles with respect to the gas mixture with the total force equaling zero. The final formula for the relative velocity of the aerosol particles contains a thermodiffusional slip component which takes the binary nature of the gaseous mixture in the thermophoretic component into account.

**40928** **APTIC NO. 64840**

Yamanaka, Tatsuo

NOBLE METAL CATALYSTS FOR ANTI-NITROGEN OXIDES MEASURE. *(Chisso sankabutsu taisakuyo kikinzoku shokubai ni tsuite). Text in Japanese. Nenryo oyobi Nensho (Fuel and Combustion), 41(5): 416-422, May 1974. 1 ref.*

Catalytic reduction of nitrogen oxides by platinum, palladium, ruthenium, and osmium supported by an alumina carrier was studied. The effect of temperature on the nitrogen monoxide-hydrogen reaction using these catalysts caused the Ru ctalyst to form the least amount of ammonia, followed by Os, and Pt and Pd formed the most, especially at about 300 C. Ammonia was effectively decomposed by Ru and mixed catalysts such as Pt-nickel and copper-nickel. The Ru catalyst, having the best ammonia- decomposing power, is even more efficient after exposure to oxygen for 10 min at 538 C. The hydrogenating and decomposing powers of Ru, combined with the low temperatures necessary, make it most efficient for NO. For the catalytic oxidation of nitrogen monoxide into nitrogen dioxide, a 0.5% Pt or Ru-alumina catalyst is effective.

**40929** **APTIC NO. 64891**

Yao, Yung-Fang Yu

THE OXIDATION OF HYDROCARBONS AND CO OVER METAL OXIDES III. CO3O4. *J. Catalysis, 33(1), 108-122, April 1974. 8 refs.*

The catalytic oxidation of carbon monoxide, ethylene, and ethane has been studied over tricobalt tetraoxide and Co3O4 supported on alumina. At low temperatures the reaction kinetics can be described by the general expression Rate equals KpO2 to the m power pCO to the n power (or hydrocarbon) pH2O to the minus 1 subscript e minus delta E/RT power, where 1, m, and n are in the range of 0.3 to 0.5 and delta E 20-23 kcal/mol. At high temperatures the rates are controlled by bulk diffusion. The specific catalytic activity over the Co3O4 powder is the highest among the various metal oxides previously studied. Mutual retardation was observed between CO and C2H4 when they coexist in the gas phase. Nitric oxide can reversibly inhibit the oxidation of CO at 200 C without reaction. A few ppm of sulfur dioxide in the gas phase can cause irreversible reduction of the Co3O4 catalytic activity at 500 C or below. At 550 C or above, finite equilibrium between the SO2 concentration in the gas phase and the reduction in activity can be reached, and the SO2 inhibition becomes reversible. The activity of the supported Co3O4 catalysts varies over several orders of magnitude depending on the method of preparation. In general, the mechanical mixtures of Co3O4 and colloidal alumina are much more active than those prepared by impregnation. The nature of the diluents used in the mixtures also influences the activity. Heating the supported catalysts to 850 C deactivates the catalysts severely due to sintering of the Co3O4, sintering of the diluents to form mass transfer barrier, and reaction to form the catalytically inactive CoAl2O4. (Author abstract)

**40930** **APTIC NO. 64660**

Yeremin, Y. N. and Y. A. Rubtsova

KINETICS OF NITRIC OXIDE DECOMPOSITION IN SILENT DISCHARGE. *(Kinetika razlozheniya okisi azota v bar ernom (tikhom) razryade). Text in Russian. Zh. Fiz. Khim., 48(5):1190-1193, 1974. 21 refs.*

The kinetics of gaseous nitric oxide decomposition in silent discharges of an ozone generator with 500 c/s, 10 kV and 15 mAmp was studied at 15 C and 60 C. The rapid decomposition of NO in silent discharge by a first-order reaction with an activation energy of 1.8 kcal/mol was determined. The maximum energetic yield was 16.6 mol NO/kW/hr at 15 C, and 24.1 mol NO/kW/hr at 60 C. Some 60% of the original NO was decomposed in 30 min, and the efficiency of the decomposition after 1.5 hr reached 99-99.5%. Elemental oxygen and nitrogen, nitrogen dioxide, and nitrous anhydride were identified as the decomposition products.

## 1973

**40931** **APTIC NO. 62984**

Flagan, Richard C., Serge Galant, and John P. Appleton

A KINETIC MODEL FOR THE FORMATION OF NITRIC OXIDE FROM ORGANIC FUEL NITROGEN. *Massachusetts Inst. of Technology, Cambridge, Fluid Mechanics Lab., Rept. 73-7, 37p., July 1973. 21 refs.*

NTIS: N73-31032

A kinetic model which describes the formation of nitric oxide from organic fuel nitrogen by combustion is presented. The predictions of model calculations for hydrocarbon fuels, which contain organic nitrogen concentrations typical of those found in naturally occurring fossil fuels, appear to be in good agreement with measurements of the nitric oxide yields obtained in premixed flame experiments. Only for rich combustion conditions at artificially reduced temperatures or for lean combustion with excessively large fuel nitrogen concentrations, are the discrepancies between the model calculations and the experimental data significant.

**40932** **APTIC NO. 60654**

Harvey, Richard D., Robert R. Frost, and Josephus Thomas, Jr.

PETROGRAPHIC CHARACTERISTICS AND PHYSICAL PROPERTIES OF MARLS, CHALKS, SHELLS, AND THEIR CALCINES RELATED TO DESULFURIZATION OF FLUE GASES (FINAL REPORT). *Illinois State Geological Survey, Urbana, Ill., Environment Protection Agency Contract 68-01-0212, Rept. 650/2-73-044, 121p., Sept. 1973. 128 refs.*

NTIS: PB 226321/AS

Thirty-seven pits in fresh-water marl located in the northeastern quarter of the united State and 24 deposits of chalk (in chalky limestone), four deposits of shell and coquina, two deposits of caliche, and a large carbonate sludge refuse pile located in the eastern part of the country were sampled and studied in relation to their potential use in limestone (CaCO3) processes for control of sulfur dioxide emission from fossil fuel combustion. Each sample and its calcined product (lime) were investigated for their petrography, mineralogy, chemistry, pore structure, and surface area. The physical characteristics of high pore volumne and fine grain size in marls and their calcines indicated that they should have high reactivities with SO2 and should be given important consideration for use in limestone scrubbing of flue gases at power plants in areas near marl deposits. Chalks and some chalky limestones were judged to have higher reactivities with SO2 than dense limestones. Carbonate shell materials were found unsuitable for crushing and using in SO2 scrubbing, although their calcines would probably be as reactive as those of other carbonates. Carbonate waste sludge was found to resemble marl in many properties and would appear to be potentially very reactive with SO2, especially for use in wet scrubbing processes.

**40933** **APTIC NO. 63286**

Hayashi, Hideo, Sataro Iwasaki, Akihiko Yoneda, Masaaki Takahashi, and Yorio Inui

EFFECT OF COMBUSTION CONDITIONS ON NITROGEN OXIDES FORMATION IN FURNACES. (I). *(Nenshoro yori hasseisuru chisso sankabutsu oyobi nensho joken no eikyo (I)). Text in Japanese. Taiki Ōsen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):349, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

The effects of combustion conditions and fuel conditions on the formation of nitrogen oxides were examined by the naphthylethylenediamine method and chemiluminescence on 11 boilers and five petroleum preparation furnaces. The maximum nitric oxide concentration for the boilers was 400 ppm, nitrogen dioxide kg/kcal 1000, and the minimum was 45 ppm. The maximum variation was 260 tons/hr boiler with the maximum of 210 ppm and the minimum 45 ppm. The increase of NO formation by the increase of the load was clear, and 5-15% of increase of NO to 10% of load increase was noted. The effects of oxygen was also great on boilers, and with a 1% variation of O2. When the gas mixture of 55% was increased to 75%, NO formation was reduced by 50%. The minimum effect was about 15%, when the oil combustion was changed to a 90% mixture of gas.

**40934** **APTIC NO. 63087**

Hegedus, L. Louis

ON THE POISONING OF POROUS CATALYSTS BY AN IMPURITY IN THE FEED. *General Motors Corp., Warren, Mich., Physical Chemistry Dept., Research Publication GMR-1394, GM PCP-11, 32p., May 16, 1973. 9 refs.*

The lifetime of various porous catalyst pellets under isothermal conditions was calculated for the case of poisoning by an impurity in the feed. Both the main reaction and the poisoning reaction can be influenced by various degrees of external and internal mass transfer effects which in general tend to increase the lifetime while simultaneously decreasing the effectiveness of the catalyst particles. Catalyst pellets of various shapes (spheres, infinite cylinders, infinite flat slabs) and catalytic monoliths were considered. The physical configuration of the catalyst particles has an important effect on the rate of their poisoning. The poisoning of catalysts by a precursor which reacts not only with the catalytic sites bur also with the support s surface in a non-selective manner was determined. (Author abstract modified)

**40935** **APTIC NO. 56511**

Kabayama, Hisao

PHOTOCHEMICAL SMOG. *(Kokagaku sumoggu). Text in Japanese. Shomei Gakkai Zasshi (J. Illum. Eng. Inst. Japan), 57(4):261-263, Arpil 1973. 4 refs.*

An elementary introduction to photochemical smog is given. The definition of smog, differences between Los Angeles smog (photochemical smog) and London smog (sulfur dioxide), content of photochemical smog, the physiological effect of ozone, problems of measuring methods of oxidants, and photochemical smog in Tokyo are described. The reason the concentration of oxidants increases at night is also described.

**40936** **APTIC NO. 64796**

Oulton, T. D.

MINERALOGY, IDENTIFICATION, AND QUANTIFICATION OF AIRBORNE TALC DUST. *Bureau Mines Information Circ., no. 8639:89-96, 1973. 3 refs. (Presented at the Symposium on Talc, Washington, D. C., May 8, 1973.)*

The mineralogy of talc compared to that of asbestos minerals, the crystallographic structure of talc, descriptive mineralogical terminology for talc, identification and quantification of airborne talc, and classification of silicate minerals are discussed. Silicate minerals include nesosilicates, sorosilicates, cyclosilicates, inosilicates, phyllosilicates, and tectosilicates. Inosilicates and phyllosilicates having chain and sheet linkages, respectively, are described.

**40937** **APTIC NO. 64597**

Razumovskiy, S. D. and G. Y. Zaikov

EFFECTS OF A BIG EXCESS OF ONE REAGENT ON THE KINETICS OF THE REACTION BETWEEN OZONE AND HYDROCARBONS. *(Vliyaniye bol shogo izbytka odnogo iz reagentov na kinetiku reaktsii ozona s uglevodorodami). Text in Russian. Izv. Akad. Nauk SSSR, Ser. Khim., no. 11:444-448, 1973. 14 refs.*

The effect of a big excess of hydrocarbons on the kinetics of the reaction between ozone and hydrocarbons such as ethylbenzene and maleic anhydride was studied. A reduction of the effective rate constant of the bimolecular reaction in the ozone-hydrocarbon system with increasing hydrocarbon concentration was determined. With the ethylbenzene concentration exceeding 0.01 M/l, the reaction rate decreased from 0.7 to 0.19 l/M sec in carbon tetrachloride. The characteristics of the reaction kinetics were independent of the nature of the solvent. The decrease in the reaction rate constant is most probably due to the interaction of the reagents with the intermediate complex.

**40938** **APTIC NO. 64459**

Sano, Isamu, Akie Tsuruizumi, Hiroshi Ohta, and Soko Yasuno

A BASIC STUDY OF PHOTOCHEMICAL SMOG--THE CHEMICAL REACTIVITY OF NITROGEN OXIDES TO AQUEOUS KI. *(Kokagaku sumoggu no kiso kenkyu--yoka kariumu suiyoek ni taisuru chisso sankabutsu no hannosei). Text in Japanese. Aichi Kogyo Daigaku Kenkyu Hokoku (Bull. Aichi Inst. Technol.), no. 8, March 1973. 1 ref.*

The most frequently used method of measuring oxidants in photochemical smog is the potassium iodide method, but nitrogen oxides also react to KI and may affect the level of Ox. In order to examine the extent of influences expirements were conducted by contacting nitric oxide and nitrogen dioxide with KI solution. It was confirmed that NO2 increases the level of Ox but NO lowers the level. A 500 ml glass jar with a rubber stopper was used for 10 ml of phosphoric acid salt buffer with KI solution (1%). The air in the jar was eliminated by helium gas and 1 ml of NO was injected into the jar. After a sufficient contact, the KI solution was taken out and ultraviolet absorpiton was examined by spectrophotometry. For the NO2 test 1 ml of NO was mixed with air, which transformed quickly into NO2. This was injected into the KI solution. NO2 was injected also into a mixture of KI solution and sodium thiosulfide solution. The ultraviolet absorption was measured by spectrophotometry. The curves of the KI solution alone and the KI solution plus sodium thiosulfide were different. After an analysis, it was concluded that NO2 separates iodine from the potassium iodine solution whereas NO and acrolein do not react similarly to KI, but possibly reduce (discolor) free iodine in the KI solution.

**40939** **APTIC NO. 64602**

Schadow, K.

BORON COMBUSTION CHARACTERISTICS IN DUCTED ROCKETS. *Combust. Sci. Technol., 5(3):107-117, May 1973. 4 refs. (Presented at the Combustion Institute, Western States Section, Spring Meeting, Denver Univ., Colo., April 26-27, 1971, Paper 71-19.)*

Boron reaction characteristics in a ducted rocket were investigated by systematically varying the primary chamber conditions in order to gain information about the combustion of boron-loaded fuel-rich plumes. Primary chamber conditions were varied by using a test device which burned boron powder and gaseous propellants (hydrogen or carbon monoxide, oxygen, and nitrogen) in the primary motor. The reaction characteristics in the secondary chamber were observed by color photography through quartz windows of the secondary chamber. The following parameters were varied: primary chamber temperature, mixture ratio of the gaseous fuel in the primary chamber from below stoichiometric to above stoichiometric at different primary chamber temperature levels, and secondary chamber pressure. Boron particle temperature at the primary nozzle exit was not sufficient to initiate self-sustained boron combustion in the air at primary motor conditions which approximated propellants with high boron and low oxidizer/fuel content. It was necessary to burn additional gaseous fuel in the secondary chamber in order to further heat up and cause ignition of the boron particles in the secondary chamber, and it was also demonstrated that the hot (probably reacting, but not ignited) boron particles was necessary for triggering the gaseous fuel ignition in the air. (Author abstract modified)

**40940** **APTIC NO. 63356**

Simpson, Edgar Alan

AUTOMOTIVE EXHAUST CONVERSION CATALYST. *(Grace (W.R.) and Co.)) U. S. Pat. 3,776,859. 4p., Dec. 4, 1973. 6 refs. (Appl. Feb. 28, 1972, 5 claims).*

A process for improving the thermal stability of auto exhaust conversion catalyst is described. It is prepared by the decomposition of a coating containing the catalyst components on a relatively inert base, in which the coating composition is stabilized in a manner such that the catalyst composite can withstand temperatures as high as 1800 to 2000 F without loss of activity. A catalyst having a good initial activity and the ability to retain this activity even on exposure to high temperatures can be prepared with a slip consisting of an alumina containing compound (alumina, mullite, or spinel) and an additive to impart viscosity and anti-settling characteristics.

**40941** **APTIC NO. 56557**

Sowinski, E. J. and I. H. Suffet

AN APPROACH FOR STUDYING THE AIR POLLUTION POTENTIAL OF SIGNIFICANT PRODUCTS RESULTING FROM AN INDUSTRIAL PROCESS. *Proc. Int. Clean Air Congr., 3rd, Duesseldorf, West Germany, 1973, p. D35-D37. 8 refs.*

An experimental laboratory apparatus has been designed and constructed to produce pyrolysis products representative of a manufacturing process, identify and quantitate pyrolysis products, and determine the stability of these products. The device was specifically designed for evaluating the chemical fate of boron hydrides and related chemicals and consists of a pyrolysis system, a gas-handling system including a static reactor, a gas chromatograph, three detectors, and a mass spectrometer interfacing system. Pyrolysis of diborane was studied with the system at atmospheric pressure; and the experiments indicated that boron hydrides can be potentially harmful air pollutants, as evidenced from observed time intervals required to reduce the boron hydrides observed to nonvolatile products.

**40942** **APTIC NO. 56506**

Suzuki, Shin

RECENT SITUATION ON PHOTOCHEMICAL SMOG (2). *(Saikin no kokagaku sumoggu ni tsuite (2)). Text in Japanese. Netsu Kanri to Kogai (Heat Management Public Nuisance), 25(9):62-73, Sept. 1973. 21 refs.*

Photochemical smog production mechanisms are discussed. Production of ozone, carbonyls, peroxyacetyl nitrate, peroxybenzol nitrate, organic nitrates, acrolein, and aerosols are discussed. The singlet oxygen mechanism does not explain why hydrocarbons enhance the rate of ozone production. Results of theories and experiments on reactions between intermediates and formaldehydes or trans-2-butene in automobile exhaust gas are discussed. Hydrocarbon reaction mechanisms and the chemical composition of Los Angeles aerosols are mentioned.

**40943** **APTIC NO. 64637**

Suzuki, Shin, Nobutoshi Horiuchi, and Koichi Nagata

PHOTOCHEMICAL REACTIONS OF SULFUR DIOXIDE AND NITROGEN OXIDES. *(Aryusan gasu--chisso sankabutsukei no kokagaku nanno). Text in Japanese. In: Chiba Prefectural Government, Department of Health Investigation and Research of the Effects of Air Pollution and Water Pollution on the Human Body, 1972. p. 16-52, May 1973. 6 refs.*

Reactions of sulfur dioxide and nitrogen oxides in the photochemical mechanism were studied. The NOx are disassociated by sunlight; SO2 is not disassociated, but may be excited by sunlight. A system consisting of SO2 and NOx was irradiated with a high voltage mercury lamp, and the variation in volume and concentration of SO2 and NOx were measured. The white condensate produced was separated by thin-layer chromatography and identified by infrared spectroscopy and mass spectroscopy. The dark reaction of the SO-2--NOx system was investigated by similar methods. The volume of SO2--NOx system increased for about 30 min, followed by a decrease which varied with the amount of SO2 in the system. Reaction kinetics and mechanisms are discussed for SO2, NO, and SO3.

**40944** **APTIC NO. 64642**

Suzuki, Shin, Nobutoshi Horiuchi, and Noriyasu Imai

PHOTOCHEMICAL REACTIONS OF SULFUR DIOXIDE--CIS BUTENE-2-OXYGEN GROUP. *(Aryusan gasu--shisu buten--2-sansokei no kokagaku hanno). Text in Japanese. In: Chiba Prefectural Government, Department of Health Investigation and Research of the Effects of Air Pollution and Water Pollution of the Human Body, 1972. p. 7-15, May 1973.*

Photochemical reaction products of sulfur dioxide--cis-butene-2-- oxygen system irradiated by high voltage mercury lamp were acetaldehyde and relatively lower molecular weight compounds in liquid form. The existence of singlet O2 is indicated in the formation mechanism of C2H40. The isomerization rate in binary SO2--C4H8-2 system is higher than that of ternary SO2-C4H8-2--O2 system, which indicates that O2 bombarded with excited SO2 is converted to singlet state. The significant difference is that the condensation product of SO2--C4H8-2--O2 system is low molecular weight compounds, while that of SO2-C4H8-2 system has characteristics of polymers. If SO2 in the triplet state is reacted with C4H8-2, the resulting products are mostly polymers. In the presence of O2, the polymer formation is suppressed. indicating the decrease in triplet state SO2. In such a system, C4H8-2 reacts primarily with singlet state SO2, producing simple addition products. The irradiated SO2 is excited to triplet state via singlet state. In the presence of O2, however, the triplet state SO2 and triplet state O2 are immediately converted to singlet states. As a result, cis-trans isomerization rate is decreased, and aldehydes and low molecular weight condensates are

**40945** **APTIC NO. 62961**

Tejwani, G. D. T., K. Fox, and R. J. Corice, Jr.

DIPOLE MOMENT DERIVATIVES FOR SO2. *Chem. Phys. Letters (Amsterdam), 18(3):365-368, Feb. 1, 1973. 20 refs.*

Absolute values of dipole moment derivatives for sulfur dioxide were determined using a new method which is an alternative to previous techniques. The method utilized measured band intensities and computed relative intensities. The dipole moment derivatives for the vibration-rotation fundamentals vl, v2, and v3 of S(32)02(16) had mean absolute values of 60.5, 63.6, and 165.9 esu/G (to the 1/2 power), respectively. These results include remeasured band intensities for vl and v2. (Author abstract modified)

**40946** **APTIC NO. 62938**

Thompson, Vinson L.

A CATALYTIC OXIDIZER ZERO GAS SYSTEM. *Preprint, Environmental Protection Agency, Washington, D. C., Quality Assurance and Environmental Monitoring Lab., 4p., 1973 (?). 1 ref.*

The development and evaluation of a catalytic oxidizer zero gas system are described. It eliminates the need for cylinder zero gas for hydrocarbon and carbon monoxide analyzers, as well as burner air and service air for hydrocarbon analyzers and gas chromatographs. It can be used for dilution air for some calibration systems. The MSA Catalytic Oxidizer consisting of a palladium-coated alumina bed and a Hopcalite bed was used. Tests were conducted at 40 ppm methane and 500 ppm CO levels. Acceptable zero gas for total hydrocarbons and CO analyzers was obtained at flow rates up to 4.72 l/min. The air contained approximately 1.5 ppm CH4 and 5 ppm CO at this higher flow.

**40947** **APTIC NO. 64850**

Yokohama National Univ. (Japan), School of Engineering

EXAMINATION OF COMBUSTION PRODUCTS OF CHLORINATED HYDROCARBONS AND THEIR HARMFULNESS-COMPOSITION OF COMBUSTION PRODUCTS OF VINYL CHLORIDE MONOMER. *(Ensoka tanka suiso no nensho seiseibutsu oyobi son yugaisei no kento--Enka biniru monoma no nensho seisei gasu sosei). Text in Japanese. Kanagawa-ken Taiki Osen Chosa Kenkyu Hokoku (Tech. Rept. Air Pollution Yokohama-Kawasaki Ind. Area), no. 15:244-253, Feb. 1973. 15 refs.*

Combustion products of the vinyl chloride monomer by stationary and non-stationary combustion methods were determined by chemical analysis and detector tubes. Gaseous products were carbon dioxide, carbon monoxide, carbon black, nitrogen dioxide, nitric oxide, hydrogen chloride, chlorine, and phosgene. The Cl2 and COCl2 are not the pyrolyzate of C2H3Cl monomer or polymer. The composition of combustion products varied greatly, depending on the comcombustion conditions. In the case of stationary combustion, in which the monomer is supplied through a nozzle, the amount of each product increased in proportion to the supply rate of monomer. The formation rate off Cl2 and COCl2 were about 1/100 and 1/5000-1/10,000 of the amount of HCl, respectively. In the case of non-stationary combustion in a sealed container with a monomer concentration of less than 5-8% which was below the stoichiometric ratio of monomer and air, the CO:CO2 was 1:10-1:20 approaching nearly complete combustion, and the amounts of Cl2 and COCl2 were 1/200-1/1000 and 1/200- 1/2500 of the amount of HCl, respectively. In the case of monomer concentration of 13-26%, CO:CO2 was 3:1-5:1, indicating incomplete combustion. The amount of Cl2 and COCl2 were 1/10,000-1/50,0000 and 1/10,3000 of HCl. The degrees of hazardousness on human health determined by taking the formation rate into consideration were in the order of HCl (mist), Cl2, COCl2, CO, CO2, and NO. The toxicity of HCL with the highest formation rate represents the overall toxicity of the combustion products.

## 1972

**40948** **APTIC NO. 60755**

Corn, Morton, Felix Stein, Yehia Hammad, Sarosh Manekshaw, William Bell, Stanley J. Penkala and Robert Freedman

PHYSICAL AND CHEMICAL CHARACTERISTICS OF RESPIRABLE COAL MINE DUST. *Ann. N. Y. Acad. Sci., vol. 200:17-30, 1972. 22 refs.*

The only dust parameter considered in determination of adherence to the Federal Coal Mine Health and Safety Act of 1969 is the weight concentration of dust, but sufficient evidence exists to demonstrate that the effects on health of a given quantity of respirably coal dust may depend on other properties and on host factors. Such properties were measured for samples of coal from two mines in the Pittsburgh seam. Properties analyzed include moisture, ash, volatile matter, fixed carbon content, sample densities, projected surfaces areas, and total surface areas. The techniques developed for these determinations are described. Significant differences in these dust parameters were found for coals in the same seam. Mine dust samples from different seams could reveal even larger differences in dust fraction properties.

**40949** **APTIC NO. 63011**

Davis, D. D., W. W. Wong, S. D. Fischer, R. L. Schiff, J. O. Lephardt, J. E. Prusaczyk, W. A. Payne, L. S. Stief, R. E. Huie, and J. T. Herron

RECENT KINETIC MEASUREMENTS ON THE REACTIONS OF O(SUPERSCRIPT 3), H AND HO2. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 126-143. 47 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

Recent kinetic parameters of the reactions of oxygen (superscript P), hydrogen, and HO2 were determined. Their reactions with other stratospheric species such as nitric oxide, nitrogen dioxide, nitrous oxide, nitric acid, ozone, oxygen, hydrogen peroxide, water, methane, carbon monoxide, and sulfur dioxide were investigated. Two different experimental techniques were used: flash photolysis/resonance-fluorescence and the photochemical O2 superscript 18, 18 isotope method.

**40950** **APTIC NO. 64596**

Goerlitz, Donald F. and LeRoy M. Law

CHLORINATED NAPHTHALENES IN PESTICIDE ANALYSIS. *Bull. Environ. Contamination Toxicol., 7(4):243-251, April 1972. 8 refs.*

Hexane solutions of the commercially prepared chlorinated naphthalenes (Halowax 1000, 1013, 1014, 1031, and 1099) are analyzed by electron capture gas chromatography to show which of the chloronaphthalene isomers may possibly interfere with the gas chromatographic analysis of pesticides containing chlorinated biphenyls. Identification of the chloronaphthalenes is made by use of a computer controlled gas chromatograph-mass spectrometer system. Typical spectra are shown for chromatographically separated chloronaphthalenes as plotted by the computer output device, with chlorine numbers being assigned to each peak. Retention times, relative to aldrin, of selected pesticides and chlorinated naphthalenes are also tabulated. The insecticides lindane, heptachlor, aldrin, and the para, para-prime isomers of DDD, DDE, and DDT elute closely to major C13, C14, C15, and C16 chloronaphthalenes.

**40951** **APTIC NO. 63030**

Hilst, Glenn R.

SOLUTIONS OF THE CHEMICAL KINETIC EQUATIONS FOR INITIALLY INHOMOGENEOUS MIXTURES. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 351- 357. 3 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

The effect of inhomogeneous mixing on chemical reaction rates was analyzed. The effects of concentration fluctuations can be significant to the point of dominating chemical reaction rates. They are characterized by joint distributions of the reactant concentrations which are skewed toward large values of these concentrations. The chemical reaction rate is significantly accelerated when the concentration fluctuations are positively correlated and is depressed when these fluctuations are negatively correlated. For strongly skewed distributions of reactant concentration which are the case when concentration fluctuations become dominant in the determination of the chemical reaction rate, the third-order correlations of these distributions must be included in the generalized chemical kinetic model.

**40952** **APTIC NO. 63117**

Johnston, Harold

LABORATORY CHEMICAL KINETCIS AS AN ATMOSPHERIC SCIENCE. *California Univ., Berkeley, Lawrence Radiation Lab., Atomic Energy Commission Contract W-7405-eng-48, LBL-497, 74p., Feb. 1972. 56 refs. (Presented at the Department of Transportation, Climatic Impact Assessment Program, Survey Conference, Cambridge, Mass., Feb. 15-16, 1972.)*

The photochemistry of nitrogen oxides was investigated to demonstrate the role of laboratory chemical kinetics in atmospheric sciences. The nitric anhydride catalyzed decomposition of ozone can be exactly predicted from other laboratory reactions. A non-controversial atmospheric quantity can be predicted from chemical rate constants obtained in the laboratory. The chemical and photochemical constants of the pure air substances, oxygen atom, oxygen molecule, and O3 are fairly well known, and these constants predict about twice as much stratospheric O3 in clean air as that observed, implicating some other agent or agents in the natural destruction of O3. Neither transport to the troposphere nor the water reactions are adequate to explain the O3 deficit. A natural source of nitrogen oxides in the stratosphere is the reaction of nitrous oxide with singlet oxygen, and the source strength is in the range of 0.25 to 2.5 times 10 to the 8th power molecules cm to the -2nd power cm/sec. (Author abstract modified)

**40953** **APTIC NO. 63237**

Omura, Hirohisa, Masakazu Tsutsumi, Koichi Ariyoshi, and Ryuichi Ishikita

VARIATION OF NUCLEIC ACIDS BY OZONATION. *(Ozon shori ni yoru kakusan no hendo). Text in Japanese. Kyushu Daigaku Nogakubu Gakugei Zasshi (Sci. Bull. Fac.*

*Agric., Kyushu Univ.) (Jubilee Volume for the 50th Anniversary of the Faculty), 26(1-4):517-523, March 1972. 16 refs.*

The effect of ozonation on deoxyribonucleic acid and ribonucleic acid was examined in relation to the bacteriostatic action of ozone and its use in the processing and storage of foods. The absorption spectrum of DNA solution was changed by ozonation depending on the pH of the DNA solution. The optical density at pH 5 between 240 and 300 micron was decreased, while below 240 micron it was increased. Optical density at pH 9 was increased below about 275 micron. The base constituents were decomposed in the following order at pH 5 and 7: thymine, guanine, and cytosine, with only adenine being maintained. The bases were detected under the same condition of treatment at pH 9. Optical density for an RNA solution was decreased at pH 5 but increased at pH 7 with a minimum rate at 270 micron; at pH 9, however, it was increased similarly to DNA. The RNA bases were degraded in the following order: guanine, cytosine or uracil, and adenine. Adenine appears to be the most stable of the nucleic acid bases in the face of ozonation.

## 1971

**40954** **APTIC NO. 62928**

Puccini, Donald S.

ECOLOGICAL MODELS AND ENVIRONMENTAL STUDIES. *Water Resour. Bull., 7(6):1144-1152, Dec. 1971. 16 refs.*

The recent world-wide trend towards centralization of all environmental management functions into one regulatory agency has illustrated the necessity for resources management agencies to adopt a total systems viewpoint. Environmental systems are typically complex and multi-dimensional in nature. Mathematical models for the management of air, water, and land resources have found wide acceptance among planners and decision-makers. Ecological models of life processes have not reached the same state of development or acceptance. A general review of ecological systems theory, ecological systems analysis, and examples of types of ecological models that have been developed to date are presented. A conceptual framework for an approach to environmental studies and the analysis of polluted environmental systems is presented. Types of ecological models discussed are population dynamics; heat, energy, and materials exchange models; aquatic ecosystems; estuarine ecosystems; and economic-ecologic systems.

**40955** **APTIC NO. 63061**

Stoeber, Werner

A NOTE ON THE AERODYNAMIC DIAMETER AND THE MOBILITY OF NON- SPHERICAL AEROSOL PARTICLES. *J. Aerosol Sci., vol. 2:453-456, 1971. 12 refs.*

The aerodynamic diameter of a nonspherical aerosol particle is primarily related to the final settling velocity of the particle. The aerodynamic diameter is not obtained directly from mobility measurements by formally calculating a sphere diameter from the mobility equation for a spherical particle. Instead, a correction factor involving the dynamic shape factor of the nonspherical particle must be applied. (Author abstract)

**40956** **APTIC NO. 63090**

Westwood, L. C.

A NEW SAMPLING METHOD FOR FLAME PHOTOMETRY. *Develop. Appl. Spectr., vol. 9:235-247, 1971. 7 refs. (Presented at the Annual Mid-America Spectroscopy Symposium, 21st, Chicago, Ill., June 2-5, 1970.)*

The use of emulsions and dispersions to convey liquid organic samples to the flame in atomic absorption and emission provides an elegant method of analysis of lubricating oils, polymer solutions, and other organic materials containing metals. Types of emulsifiers and the effect of various emission characteristics on the analytical results are discussed. The flame photometric emulsion technique was used for atomic absorption measurements of zinc, cadmium, magnesium, and barium in oils. Additive metals in lubricants, lead in gasoline, nickel naphthenate, and iron oxide in paint were analyzed by emulsification and atomic absorption, and additive metals in lubricants were measured by emulsion and X-ray fluorescence. (Author abstract modified)

## 1965

**40957** **APTIC NO. 62957**

Stotzky, G.

REPLICA PLATING TECHNIQUE FOR STUDYING MICROBIAL INTERACTIONS IN SOIL. *Can. J. Microbiol., vol. 11:629-636, 1965. 28 refs.*

A replica plating method was developed to study ecology of microorganisms in soil. Precise placement of inocula and amendments at desired loci in sterile soil contained in petri plates were accomplished with a template. Subsequent growth and distribution of individual species, even when part of a mixed population, was measured by periodic transfer with an easily constructed replicator to agar plates of differing nutritional composition or containing selective inhibitors. The method is rapid and reproducible, and permits the study of many variables and interactions in a single soil plate; it can also be used with nonsterile soil and other suitable microbial habitats. Applications of this technique are being made in studies concerned with the influence of air pollutants on natural microbial populations. (Author abstract modified)

## 1958

**40958** **APTIC NO. 63051**

Gutterman, Bernard

DUST PROPERTIES IN RELATION TO DUST COLLECTION. *Pennsylvania State Univ., College Park, Dept. of Civil Engineering, Thesis (Ph.D.), Aug. 1958, 121p., 23 refs.*

Dust properties in relation to dust collection are considered in terms of analyzing the physical properties of dusts which determine the shear stresses or associated velocities necessary to pick up motionless particles from a wall or a dust layer and predicting concentration gradients due to backmixing by turbulent diffusion. Bouncing of the particles in a gas suspension appears to govern the condition of backmixing in the case of larger particles; and a concentration field, based on the normal distribution of bounce angle and model data, can be predicted rather accurately if one point of concentration is known.

# EFFECTS-HUMAN HEALTH

## 1974

**40959** **APTIC NO. 63347**

Einbrodt, H. J., J. Rosmanith, and A. Schroeder

CHILDREN IN DANGER THROUGH DIRT AND WASTE DUMPS. LEAD POISONING FROM PLAYING. *(Kinder durch Schmutz und Haldenrueckstaende gefaehrdet. Beim Spielen durch Blei vergiftet). Text in German. Umwelt (Duesseldorf), 4(3):30-32, 1974. 3 refs.*

In Stolberg with its metallurgical industry, where primarily zinc, copper, and lead are treated, 600 children from 2 to 14 years of age were examined as to the lead level of the blood, the hair, and the urine. With few exceptions, children with a highly increased lead level in the blood came from those areas of the city with the highest lead pollution of the atmosphere of

(10 mg Pb/sq m day). Of the few exceptions one came from an area with extremely low lead pollution of the atmosphere (less than 0.5 mg Pb/sq m day). But it turned out that the child had played on the slag dump of a zinc plant which was no longer in operation. Analyses of the top layer of this dump yielded lead concentrations of 1.3 to 2.1%. In children who played on this dump lead levels of 80 and more micrograms Pb/100 ml blood and up to 1400 micrograms Pb/g hair were measured. This clearly indicates that there are two routes of lead intake, through inhalation and peroral.

**40960** **APTIC NO. 64636**

Franks, H.

PUBLIC HEALTH ASPECTS OF AIR POLLUTION FROM DIESEL VEHICLES. *Public Health (London), 88(4):175-181, May 1974. 7 refs.*

The health effects of diesel engine vehicle emissions are reviewed. The presence of hydrocarbons may give rise to a distinctive smell but, in amount, they are normally regarded as non-hazardous. Traces of aldehydic materials resulting from partial oxidation of hydrocarbons may be found in engine exhausts. They are normally regarded as non-hazardous in the amounts present in the streets although they may have an objectionable odor and at higher concentrations produce eye irritation. Under certain conditions of operation diesel engine exhaust may contain traces of polynuclear aromatics formed from the simpler fuel molecules. Some of these are carcinogenic to animals but this fact has little relevance to the genesis of lung cancer in man. Diesel fuels commonly contain sulfur compounds on the order of 0.5%, but this is of no clinical significance. Too little is known about the concentration of nitrogen oxides in the atmosphere which can seriously affect animal and plant life, in the absence of sunlight effects, and this has made the meaning of control limits controversial. Under certain conditions of hydrocarbon fuel combustion in the presence of an inadequate supply of air, particularly with the heavier less volatile fuels, the greater affinity of hydrogen for oxygen results in the formation of free carbon and consequent production of visible smoke. The smoke, although objectionable, is not in itself considered to be toxic but its production in anything but small amounts is usually accompanied by the formation of carbon monoxide. The question of whether or not there is such a disease as chronic carbon monoxide poisoning is still not resolved, but there is mounting evidence that concentrations in the blood amounting to between 5 and 10% saturation can disturb psychomotor abilities and perception, can impair visual discrimination for brightness, and produce impairment in control precision and multiple limb coordination.

**40961** **APTIC NO. 63121**

Gardner, D. E.

ANIMAL MODELS FOR HUMAN DISEASE. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Experimental Biology Lab., 6p., 1974. 13 refs.*

Currently available animal models for use as biological indicators of adverse human health effects resulting from environmental agents are described, characterized, and evaluated. The two general approaches that are employed utilizing animal models are: studies that seek to identify the target organ or function which is the most sensitive to the assault, and studies that concern the mechanism of the observed toxic effect. Good agreement has been obtained between epidemiologic and animal studies concerning the effect of polluted air on infectious disease processes, and increasing emphasis is being placed on the role of pollutants in the enhancement of morbidity from respiratory infections. A model system is outlined for studying the effect of a pollutant on increasing susceptibility to respiratory infection challenge and includes such elements as mortality rates, survival time, phagocytic capability, bacteriocidal activity, hydrolytic enzymes activity, inflammatory response, and alteration in immune competence.

**40962** **APTIC NO. 63145**

Gershanik, Juan J., G. Gary Brooks, and Joseph A. Little

BLOOD LEAD VALUES IN PREGNANT WOMEN AND THEIR OFFSPRING. *Am. J. Obstet. Gynecol., 119(4):508-511, June 15, 1974. 24 refs.*

Lead levels were determined from maternal and neonatal blood samples collected at a general-care hospital. Ninety-eight cord blood pair samples showed a high correlation of lead levels of mothers and corresponding infants with a product moment correlation coefficient of 0.6377. Thus, neonates are born with lead levels comparable to maternal levels. Increased values of lead in the atmosphere which may cause increased lead levels in mothers may also cause increased lead levels in infants. While age and race did not affect blood lead levels, blood lead levels were significantly higher in mothers and infants from urban compared to rural areas. The mean blood lead value for the urban maternal group was 2.1 micrograms/100 ml higher than the rural group (10.9 compared to 8.8 micrograms Pb/100 ml). (Author abstract modified)

**40963** **APTIC NO. 64825**

Hattori, Shoji and Koichi Takemura

ULTRASTRUCTURAL CHANGES IN THE BRONCHIAL ALVEOLAR SYSTEM CAUSED BY AIR POLLUTION AND SMOKING. *(Nihon Rinsho Denshikenbikyo Gakkaishi J. Clin. Electron Microsc. Soc. Japan, 6(3-4):350, March 1974.*

Electron microscopic histomorphological changes in the bronchial alveolar system are reported for nitrogen dioxide exposure experiments with mice and for biopsy examinations of heavy smokers. Inhalation of 0.5 ppm NO2 by mice for 30-45 days induces shortening and reduction of cilia, edematous changes of the alveolar epithelial cells, and edema of the alveolar interstitium, with hyperplastic foci due to proliferation of epithelial cells of the peripheral bronchus. Morphological changes in mouse lungs exposed to NO2 for 6 mo consist of a prominence of lung fibrosis instead of the hyerplastic foci. Mouse lungs exposed to polluted air for 12 mo show shortening and atypical hyperplasia of bronchial epithelial cells, with the changes being very similar to those of the bronchial epithelial layer of heavy smokers. Examination of biopsy material from heavy smokers reveals shortening and reduction of cilia, extraordinary increase of tonofibrills, irregularity in nuclear shape, squamous metaplasia, and atypical hyperlasia in the bronchus and surrounding bronchial epithelia, with the observations being strongly suggestive of oncogenic change.

**40964** **APTIC NO. 63128**

Hinners, Thomas A., Willie J. Terrill, Jane L. Kent, and Anthony V. Colucci

HAIR-METAL BINDING. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Bioenvironmental Lab. Branch, 20p., 1974 (?). 56 refs.*

Extensive removal of several hair metals (sodium, magnesium, potassium, calcium, manganese, iron, nickel, copper, zinc, cadmium, and lead) by ambient extraction with 1% nitric acid is documented for a variety of hair specimens. Anatomical location and chemical nature of the metal binding to hair are discussed in reference to other published reports. Secretion of the metals onto the preformed or nearly formed hair shaft is consistent with the evidence obtained for the majority of metals tested. Ambient extraction of some hair metals appears acceptable for mass screening purposes since total digestion procedures are reported to have a metal replicate variability of about plus or minus 10%. (Author summary modified)

**40965** **APTIC NO. 64845**

Ishinishi, N.

EPIDEMIOLOGY OF RESPIRATORY DISEASES CONCERNING AIR POLLUTION, ESPECIALLY IN THE KITA-KYUSHU DISTRICTS. *(Ekigaku; tokuni Kitakyushu o chushin to shite). Text in Japanese. Nihon*

*Kyobu Shikkan Gakkai Zasshi (Japan J. Thoracic Dis.), 11(12):709-713, Dec. 1973. (Presented at the Japan Society for Thoracic Diseases, Annual Meeting, 23rd, Symposium of Air Pollution and Respiratory Diseases, 2nd, April 1973, Paper 1.)*

According to an epidemiological study on the effects of air pollution on human respiratory diseases based on the morbidity of new patients among peoples respectively living in Yawata in Kita-kyushu City(I), Minami and Nishi in Fukuoka City(II), and Amaki City(III) and joining the national health insurance, the average corrected morbidity of bronchitis for 1000 inhabitants is 205.1(male) and 189(female) in (I), 174.8(m) and 158.5(f) in (II), and 176.8(m) and 139.5(f) in (III). Asthma is 20.0(m) and 15.3(f) in (I), 19.9(m) and 15.1(f) in (II), and 18.4(m) and 10.4(f) in (III). Rhinitis and upper air way inflammation are 57.5(m), 94.6(m), and 42.2(f), 90.9(f) in (I); 29.9(m), 43.7(m) and 23.5(f), 44.2(f) in (II); and 26.0(m), 34.6(m) and 18.5(f), 30.2(f) in (III). Higher morbidities in Yawata in Kita-kyushu are shown. The morbidity of other diseases possibly concerning air pollution such as ocular foreign bodies, lung cancer, and nasopharyngeal cancer was also higher in the most air polluted district (Yawata) than in a slightly air polluted district (Fukuoka), or a non-air polluted district (Amaki). The examination of chronic respiratory diseases in women older than 40 in two parts of Kita-kyushu City which differ two-fold in aerial SO2 concentration and amount of falling dust showed a proportional rise in complaints. An investigation on schoolchildren showed a correlation between infantile asthmalike symptoms and air pollution. Recent investigations on chronic respiratory diseases showed the same tendency. The etiology of lung cancer is affected by smoking, occupation, and air pollution, in that order.

**40966** **APTIC NO. 63365**

Jones, R. B., D. P. Nelson, S. Shapiro, and L. A. Kiesow

SYNERGISM IN THE TOXICITIES OF LEAD AND OXYGEN. *Experientia, 30(4), April 15, 1974. 3 refs.*

Rats were injected intravenously with either deionized water or deionized water plus lead acetate and subjected to increasing atmospheres of oxygen. The mean median survival time in hours was 28.0 + or - 4.4 and 79.0 + or - 15.7 for groups of lead- and nonlead-treated rats. The effect of lead acetate on survival time was dose dependent. Autopsy histological examination of the brain, heart, lung, liver, kidney, and adrenal gland showed no significant pathological changes. Blood gas determinations were made to measure pulmonary function. No significant differences were observed after 24 hr of exposure. Nonlead-treated rats exposed to oxygen for 68 hr and near death were severely hypoxic, acidotic, and hypercarbic. The central nervous system toxicity of high partial pressures of oxygen is impressive. When lead acetate was given 1 hr prior to oxygen exposure, there was no change in the time of exposure required to produce convulsions or in the survival time. When it was given 18 hr prior to exposure, while there was still no significant change in the time of appearance of convulsions, the survival time was significantly shortened. Thus, lead and oxygen are capable of acting synergistically to hasten death.

**40967** **APTIC NO. 64931**

Kawakami, M., S. Sato, S. Maeda, and T. Takijima

AN ULTRAMICROMORPHOLOGICAL STUDY ON THE LUNG OF RATS WHICH INHALED OZONE OF LOW CONCENTRATION, BASED MAINLY ON SCANNING ELECTRONMICROSCOPIC OBSERVATION. *(Tei nodo ozon kyunyu ratto hai no cho-bikeitaigakuteki kenkyu - sosa-gata denshi kenbikyo ni yoru kansatsu o chushin ni). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), vol. 12 (Suppl.):16-17, March 1974. (Presented at the Japanese Society for Chest Diseases, Annual Meeting, 14th, Tokyo, Japan, April 2-3, 1974.)*

Rats were exposed to ozone at 0.2-0.4 ppm for 3 hr/day for 16 consecutive days. The animals were sacrificed on the 1st, 5th, 11th, and 16th days of exposure, and histological specimens were obtained from large bronchus, small bronchus, and alveole which were observed by scanning electronmicroscopy. The characteristic change of the large and small bronchi after ozone inhalation was a bulbous swelling of the cilial apex. After 11-16 exposures, no mucus was found on the swollen cilial apex. A tendency towards increased irregularity of arrangement the number of exposures increased, and mutual fision of cilia appeared after five and 16 exposures. The amount of cell debris in the bronchi was small. After 16 inhalations, an irregular undulation of alveolar walls appeared. No difference of symptoms or severity between large and small bronchus was observed.

**40968** **APTIC NO. 64681**

Kitamura, S.

EFFECTS ON ENVIRONMENTAL POLLUTION ON HUMAN BODY AND THE IMPORTANCE OF CLINICAL LABORATORY EXAMINATION. *(Kogai no jintai ni oyobosu eikyo to rinsho kensa ni tsuite). Text in Japanese. Eisei Kensa (Med. Technol.), 23(2):51-52, Feb. 1974.*

Air pollutants such as sulfur oxides, nitrogen oxides, and lower alkyl mercury compounds, can be retained in the body after inhalation. Since decomposition and excretion in the body are in proportional to the extent amount of noxious materials, they do not accumulate proportionally to exposure when they are absorbed at a very small amount every day. The speed of accumulation slows gradually. The effects of low-level exposures at an early stage cannot be examined properly by one clinical investigative method.

**40969** **APTIC NO. 63086**

Koob, George F., Zoltan Annau, Robert J. Rubin, and Mark R. Montgomery

EFFECT OF HYPOXIC HYPOXIA AND CARBON MONOXIDE ON FOOD INTAKE, WATER INTAKE, AND BODY WEIGHT IN TWO STRAINS OF RATS. *Life Sci., 14(8):1511-1520, 1974 (?). 19 refs.*

The effects of hypoxic hypoxia and carbon monoxide exposure on food intake, water intake, and body weight in hooded Long-Evans and Sprague-Dawley rats were investigated. Rats were exposed for 24 hr to three levels of altitude containing 16% oxygen, 14% O2, and 10% O2. They were also exposed to three levels of CO: 250 ppm, 500 ppm, and 1000 ppm. Both strains of rats showed decreases in food intake, water intake, and weight gain that were directly related to the degree of hypoxia or CO exposure. All measurements suggest that the critical concentration of CO is about 250 ppm. Nutritional alterations in biochemical studies of prolonged exposure to hypoxia to CO need consideration. (Author summary modified)

**40970** **APTIC NO. 64947**

Krotova, Y. I. and V. I. Muzyka

THE ERYTHROCYTIC DELTA-AMINOLEVULINIC ACID LEVEL IN WORKERS EXPOSED TO CARBON MONOXIDE. *(Soderzhaniye del ta-aminolevulinovoy kisloty v eritrotsitakh rabochikh, imeyushchikh kontakt s okis yu ugleroda). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 6:43-44, 1974. 5 refs.*

The carboxyhemoglobinemia and the delta-aminolevulinic acid level in the erythrocytes were measured in 56 workers occupationally exposed to carbon monoxide for about 2 yr. The carboxyhemoglobin level increased from an average of 3.2% at the start of the workday to 4.0% by the end of the day. The delta-aminolevulinic acid level in the erythrocytes varied from 2.7 to 6.9 micrograms/ml against a control range of 0.7-2.5 micrograms/ml in 14 of the 56 workers. Eleven out of the 14 subjects with increased delta-aminolevulinic acid level complained of symptoms indicative of problems in the central nervous system. The delta- aminolevulinic acid level in the erythrocytes and the specific complaints may be used for assessing the sensitivity of the organism to CO.

**40971** **APTIC NO. 64948**

Livke, T. N., A. T. Lobachuk, and M. V. Gavrilyuk

THE NUCLEIC ACID LEVEL IN THE LUNGS AND LIVER OF RATS POISONED BY CROTON- AND ACETALDEHYDE. *(Soderzhaniye nukleinovykh kislot v legkikh i pecheni krys pri intoksikatsii krotonovym ili uksusnym al degidom). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 6:55, 1974. 4 refs.*

Changes in the total protein level and in the protein fraction ratios in the blood serum, and in the nucleic acid levels in the lung and liver of albino rats having been exposed to croton- and acetaldehyde at 0.02 mg/l for 2 mo, 7 hr daily and 5 days a week. Sneezing and hyperemia of the skin were observed during the exposure time. Edema and hemorrhages in the lungs, and hepatomegalia were detected on autopsy. Crotone aldehyde increased the albumin, and decreased the alpha2-globulin levels in the blood. Both the absolute and relative contents of the total nucleic acids increased, due to the increase of the ribonucleic acid level in both groups of animals. Relative to the organ weight, an increase of the desoxyribonucleic acid and ribonucleic acid levels in the liver was determined in the group exposed to acetaldehyde.

**40972** **APTIC NO. 63204**

Mottet, Norman Karle and Ralph L. Body

MERCURY BURDEN OF HUMAN AUTOPSY ORGANS AND TISSUES. *Arch. Environ. Health, 29(1):18-24, July 1974. 36 refs.*

Flameless atomic absorption spectroscopy was used to assay the total mercury burden in 14 autopsied organs and tissues from 113 persons. Their ages ranged from 26 weeks of gestation to 88 years. Over 70% of all assays, irrespective of organs or age, had a burden of less than 0.25 micrograms/g of wet weight. Less than 10% had more than 0.75 micrograms/g. The kidney was the organ with the most variable burden, 29% of the assays being above 0.75 micrograms/g. The burden in fetal organs was more uniform than those in postnatal life. Multivariate statistical analysis suggests that the urban population has a somewhat greater mercury burden than the rural. Data did not reveal a statistically significant increase with age, suggesting that past environmental exposure levels did not exceed the capacity of the body to eliminate mercury. (Author abstract)

**40973** **APTIC NO. 64918**

Navakatikyan, A. O., L. N. Rossinskaya, and A. M. Marin

FEATURES SPECIFIC FOR INTERMINGLING OF GASES IN THE LUNGS IN DIFFERENT FORMS OF DUST-INDUCED PATHOLOGY. *(Oso yennosti Smeshivaniya Gazov V legkikh Pri Raznykh Fopmakh P ylevoy Patologii). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 6:7-10, 1974. 7 refs.*

Respiratory function tests and gas mixing studies were performed on practically normal subjects and patients with dust-induced pathological conditions of the respiratory tract. The protracted effect of dust resulted in changes in the mixing uniformity index and in the time for complete intermingling of gases to occur in the lungs, with the changes appearing prior to manifestation of pathology and progressively increasing with the emergence of dust-produced bronchitis or pneumoconiosis. Correlations were also revealed between indices characterizing the process of gas mixing and other aspects of external respiration. The use of the uniformity index and time for complete gas intermingling is recommended for early diagnosis of dust-induced pulmonary disorders.

**40974** **APTIC NO. 64648**

Pankow, D., W. Ponsold, and G. Wagner

THE EFFECT OF NOISE ON THE CO-INDUCED INCREASES OF THE LAP- AND GPT-ACTIVITY IN THE PLASMA OF RATS. *(Einfluss von Laerm auf die CO-induzierte Erhoehung der LAP- und GPT-Aktivitaet im Plasma von Ratten). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 29(7):404-405, 1974. 8 refs.*

The effect of noise on the carbon monoxide-induced increase in the leucine aminopeptidase and glutamate pyruvate transaminase activities in the plasma of albino rats was studied. Plasma carboxyhemoglobin levels over 55% can lead to an increase in the activity of these enzymes. The test animals were exposed to a noise level of 80 dB 9 times for 12 hr within 2 weeks or 4 times for 12 hr within 1 week, after which they were administered single injections of 9.6 mMol CO/kg of body weight. The LAP- and GPT activities, already increased by CO, were not further increased by exposure to noise. In rats exposed to noise in the 2-week experiment, the expected increase in the LAP and GPT activities due to the subsequent administration of CO failed to occur.

**40975** **APTIC NO. 63154**

Pavlenko, G. I., S. A. Osina, and R. S. Vorontsov

THE EFFECT OF TRIFTAZINE INHALATION IN EXPERIMENTS ON ANIMALS. *(Ingalyatsionnoye vozdeystviye triftazina v usloviyakh eksperimenta na zhivotnykh). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 4:27-30, 1974. 5 refs.*

The results of a study on rats and guinea pigs into the effect produced by inhalation of triftazine showed that the threshold of a one-time specific action on the central nervous system (Lim ac spec equal to 15 mg/cu m) is below its action on the integral indices (Lim ac integr equal to 26 mg/cu m) by as much as 17 times. This proves triftazine displays a higher degree of neurotropic action. A chronic experiment with a concentration of 0.66 mg/cu m failed to elicit any specific effect of triftazine on the central nervous system. The 0.06 mg/cu m concentration is taken according to integral indices as a threshold of the chronic action level. The nature of the chronic action zone (Z ch equals 433) is a factor pointing to an extreme danger of a chronic triftazine poisoning. The recommended maximum permissible concentration of triftazine in the atmosphere of a work premise at a level of 0.01 mg/cu m has been approved and enacted in pertinent legislation in the USSR.

**40976** **APTIC NO. 63293**

Pavlovskaya, N. A. and L. G. Makeyeva

PECULIAR FEATURES OF THE MICRODISTRIBUTION OF THORIUM IN THE LUNGS OF RATS AFTER THE INTRATRACHEAL ADMINISTRATION OF ITS COMPOUNDS. *(Osobennosti mikroraspredeleniya toriya v legkikh krys posle intratrakheal nogo vvedeniya yedo soyedineniy). Text in Russian. Gigiena i Sanit., no. 5:29-33, 1974. 6 refs.*

The microdistribution of thoria in the rat lung after intratracheal administration of single doses of thoria and thorium chloride was studied by historadiography. A nonuniform distribution of thorium atoms in the lungs, regardless of the solubility of its compounds was observed. In the case of thoria, an increase of the degree of nonuniformity of distribution with time was determined. In the case of thorium chloride, the initial diffuse distribution changed to accumulations especially in the peribronchial tissue. In both cases, the thorium concentrations were highest in the interstitial tissue. The coefficient of non-uniformity, i.e., the ratio of the maximum number of alpha-particle tracks to the arithmetic mean ranged from 7 to 35 for thoria, and from 2.6 to 40 for thorium chloride.

**40977** **APTIC NO. 64705**

Penney, David, Meredith Benjamin, and Emmett Dunham

EFFECT OF CARBON MONOXIDE ON CARDIAC WEIGHT AS COMPARED WITH ALTITUDE EFFECTS. *J. Appl. Physiol., 37(1):80-84, July 1974. 32 refs.*

Sixty-day-old rats were continuously exposed over several weeks to 100, 200, and 500 ppm carbon monoxide in air. Carboxyhemoglobin levels of 9.26%, 15.82%, and 41.12% of the total hemoglobin and 0.94, 2.08, and 10.5 g/100 ml increases in hemoglobin were observed at sacrifice, respectively. Significant increases in heart weight, however, were detectable only following exposure to 200 ppm (12.03%) and 500 ppm (42.06%) CO. At 500 ppm CO, increases in heart weight resulted from significant increases in the weight of the left ventricle plus the interventricular septum (LV + S), right ventricle (RV), and especially the atria. The ratios of RV/LV + S weights of CO-poisoned rats were similar to controls. In altitude-exposed rats also showing marked hemoglobin and heart weight increases, the RV was the major site of the weight increase, with the RV/LV + S ratio rising significantly above CO-exposed and control rats. Apparently, CO concentrations near 100 ppm and above result in hemoglobin increases, while CO near 200 ppm is required for significant effects on heart size. Unlike altitude cardiac enlargement which involves primarily the RV, CO exposure produces an overall increase in heart weight. (Author abstract)

**40978** **APTIC NO. 63247**

Pylev, L. N. and G. D. Yankova

STUDY OF THE POSSIBILITY OF ADSORPTION OF BENZO(A)PYRENE, AND OF THE BENZO(A)PYRENE CONTENTS IN CERTAIN DOMESTIC INDUSTRIAL BLACKS. *(Izucheniye vozmozhnoy adsorptsii benz(a) pirena i yego soderzhaniya v nekotorykh otechestvennykh promyshlennykh sazhakh). Text in Russian. Gigiena Truda i Prof. Zabolevaniya, no. 4:52-53, 1974. 9 refs.*

The benzo(a)pyrene adsorption by and the benzo(a)pyrene content in polygraphic channel black type KGO-250 with a particle size of 12.8 nanometers and a specific surface of 250 sq m/g, and of thermal black type TG-10 with a particle size of 304.7 nanometers and a specific surface of 10.6 sq m/g were studied, using benzene and infusine for extraction, and a spectrofluorimetric method for determination. The channel black absorbed 3 to 9 times more benzo(a)pyrene than the thermal black. Both benzene and infusine extracted much more benzo(a)pyrene from thermal black than they did from the channel black, which is due to the high surface activity of the latter. Increase of the quantity of adsorbed benzo(a)pyrene with increasing size and decreasing specific surface was observed. Carbon black and soot, apart from being a source of benzo(a)pyrene in the organism, continue to adsorb benzo(a)pyrene entering the organism, other sources. The presence in the lungs of inflammatory processes, tuberculotic foci, bronchiectases, and abscesses, leading to increased protein and lipid release, may facilitate the extraction of benzo(a)pyrene from soot present in the pulmonary parenchyma.

**40979** **APTIC NO. 64932**

Sato, S. and E. S. Boatman

AN ULTRAMICROMORPHOLOGICAL STUDY OF THE LUNGS OF RABBITS AFTER INHALATION OF OZONE AT LOW CONCENTRATIONS. *(Tei nodo O3 kyunyu kato-hai no cho bikeitaigaku-teki kenkyu). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), vol. 12(Suppl.):17, March 1974. (Presented at Japan Society for Chest Diseases, Annual Meeting, 14th, Tokyo, Japan, April 2-3, 1974.)*

Two groups of rabbits were exposed to ozone, the first group at 1 ppm once for 3 hr/day and the second group at 0.5 ppm 3 hr/day for 2 days and further exposed at 1 ppm for 3 hr on the third day. After inhalation of ozone they were sacrificed, the specimens were taken from the large, medium, and small bronchi, bronchiole, and alveoli. The electronmicrographical findings were compared for toxic effects of chronic inhalation of ozone at low concentrations. The first group showed various pathological states from denaturation to necrosis of the cilial epithelium and chalice cells in the bronchi accompanied by a noticeable reduction of mitchondria. Significant changes in the non-ciliated cells in bronchioles, edematous swellings of the alveolar epithelium, and alveolar ulcers were also observed. The second group showed concentrated denaturation of cilial cells in the large bronchus; increased secreted granules in the cytoplasm of chalice cells with slight changes of cytoplasm in bronchial cells; vacuolar swelling of the cilia; and edematous swellings in both the alveolar epithelium. Tolerance to ozone appeared after relatively short period.

**40980** **APTIC NO. 64484**

Sato, Y. and F. Tsunoda

EFFECTS OF AIRBORNE FLUORIDE ON GOATS, PART I: PLACENTAL TRANSFER OF FLUORIDE. *(Taiki chu fukkabutsu no kankyo osen ni yoru yagi no bakuro jikken (dai ippo) fukkabutsu no taiban tsuka ni tsuite). Text in Japanese. Nippon Koshu Eisei Zasshi (Japan. J. Public Health), 21(5):291-295, May 1974. 32 refs.*

The placental transfer of fluoride as an environmental pollutant via air was examined on goats bred in the polluted environment surrounding an aluminum refinery in Fukushima Prefecture. The concentration of hydrogen fluoride in the air at a point 0.5 Km from the refinery averages 0.6-1.4 ppb, and is less than 4 ppb at the highest. The animals were fed with weeds and vegetables grown there as well as with bran in the winter season. The fluoride content in the blood of the mother goats increased proportionately with the fluoride content of the feed. An increase of the fluoride content of the mother goat s blood increased retention of fluorides in the body of newborns, especially in the hard tissues. Airborne fluoride can be transferred via polluted feeds from the mother to her offspring.

**40981** **APTIC NO. 64483**

Sekizawa, S., R. Endo, S. Nagaoka, and S. Yoshida

ON THE EFFECTS OT TOKYO-PHOTOCHEMICAL SMOG ON HUMAN BODY: RESULTS OF INVESTIGATIONS OF SUBJECTIVE SYMPTOMS OBTAINED BY QUESTIONNAIRES. *(Tokyo sumoggu no jintai eikyo ni tsuite: anketo ni yoru jikaku shojo chosa kekka). Text in Japanese. Tokyo-to Kogai kenkyusho Nenpo (Annu. Rept. Tokyo Met. Res. Inst. Environ. Prot.), vol. 5:206-227, March 1974.*

Epidemiological studies on schoolchildren affected by Toko-type photochemical smog episodes show subjective symptoms of eye irritation, throat irritation, and cough appearing in children who were outside, and headache and dullness attacking those inside. Dyspnea, convulsions, unconsciousness, and numbness in the extremities affected children who were exercising outdoors. Symptoms of mucosal irritation were sharply aggravated by higher oxidant concentrations. Headache and eye irritation were more pronounced in girls, and throat irritation more common in boys. A questionnaire polling approximately 1000 pupils was compared to air quality measurements and general symptoms such as dullness, headache, and eye irritation could be correlated to aerial sulfur dioxide concentrations and eye irritation could be correlated to the oxidant concentration. The questionnaire is an effective tool in examining chronic effects of air pollution.

**40982** **APTIC NO. 64444**

Seto, K., S. Ishida, T. Imamiya, M. Kawakami, K. Sugita, and M. Shishido

INFLUENCE OF INHALATION OF SULFUR DIOXIDE ON THE FORMATION OF PHOSPHOLIPIDS IN THE LUNG. *(Hai no rinshishitsu no seisei ni taisuru aryusan gasu kyunyu no eikyo). Text in Japanese. Igaku to Seibutsugaku, 88(1):55-58, Jan. 1974.*

The effects of sulfur dioxide inhalation on the formation of phospholipids in the lung tissue which plays an important part in the reservation of air in the alveoli of the lung were studied by incorporating C(14) from C(14)-1-acetic acid into each fraction of phospholipids from lung slices taken from rabbits after inhalation of SO2. Inhalation of 0.2, 0.5 or 1.0 ppm of SO2 from 1-3 hr had little influence on the incorporation of C(14) into each phospholipid fraction. The incorporation of C(14) into lecithin (LC) by inhalation of 0.2 ppm of SO2 for 1 wk decreased, and 2 week inhalation decreased the incorporation of C(14) into LC and phosphatidyl ethanolamine (PE). The inhalation of 0.5 ppm of SO2 for 1 wk reduced the incorporation of C(14) into LC and PE. Inhalation of 0.5 ppm of SO2 for 2 wk also reduced the incorporation of C(14) into LC, PI + PS and PE. The inhalation of 1.0 ppm of SO2 for 1 and 2 wk decreased the incorporation of C(14) into shingomyelin (SP), LC, PI + PS, and PE.

**40983** **APTIC NO. 63205**

Stein, Patricia C., Evan E. Campbell, William D. Moss, and Patricio Trujillo

MERCURY IN MAN. *Arch. Environ. Health, 29(1):25-27, July 1974. 12 refs.*

Mercury analyses were performed on tissues removed at autopsy from 47 human subjects from two geographical areas, the urban area of Denver and the surrounding rural area. Data obtained from lung, liver, and kidney could not be correlated with age, sex, or place of residence at the time of death. The highest concentrations of mercury were found in the kidney. Whether wet or dried tissue was analyzed did not affect the results. Data are presented to establish some base lines for levels of mercury in a general population. Ninety-nine percent of the population will have less than 1 microgram of Hg/g of lung tissue. The median concentration is 0.03 micrograms/g of wet weight tissue. Ninety-five percent of the population will have less than 0.2 micrograms Hg/g liver tissue, and less than 3.0 micrograms Hg/g of kidney tissue. (Author abstract modified)

**40984** **APTIC NO. 63220**

Stoefen, D.

ENVIRONMENTAL LEAD AND THE HEART. *J. Mol. Cell. Cardiol., 6(3): 285-290, 1974. 36 refs.*

Present levels of environmental lead contamination produce a measurable biochemical alteration in man (inhibition of the delta-aminolevulinic acid dehydrase) which may cause cardiovascular disease. Various studies on the effects of lead on the cardiovascular system are reviewed. Lead can cause an increase of cholesterol, changes in circulating lipids characteristic of arteriosclerosis, changes in systolic pressure, disturbances of cellular respiration, changees in rat heart and skeletal muscle, changes of the contractile function of the myocardium, and biochemical changes in the myocardium affecting heart infarction. These studies showed a contribution of Pb to heart diseases even in people without professional exposure to Pb. The increase of cardiovascular diseases correlates with the lead uptake in countries with densely motorized traffic. Generally, the lead uptake of primitive tribes is low and so is their mortality from cardiovascular ailments.

**40985** **APTIC NO. 64625**

Stupfel, M. and M. Mordelet-Dambrine

PENETRATION OF POLLUTANTS IN THE AIRWAYS. *Bull. Physio-pathol. Respir. (Nancy), 10(4):481-509, Aug. 1974. 165 refs.*

The physicochemical process of the penetration of gases, liquids, and solid aerosols into the respiratory system are discussed with reference to air pollutants. Modifications of penetration related to the means of penetration, biological reactions of the respiratory system to pollutant penetration, physiopathological factors influencing the penetration and the retention of air pollutants, and various methodology and research prospects are reviewed. Deposition into the respiratory system depends on the anatomical pathway of the inspired air: through the nose, mouth, or a tube in the mouth. The nose, the oropharynx, and the trachea provide efficient protection by the route through which they constrain the air influx and by their secretions and mucociliary activities. By-pass of the nose filter can result from irritative congestion by air pollutants. Human and animal experiments have demonstrated that the inhalation of certain pollutants produces immediate physiological reflexes: nasal (ammonia and odors) and bronchomotor (sulfur dioxide and tobacco smoke) modifying airway calibers; surfactants can be altered; and humoral mediated reactions can be elicited. The extent of the exchange between the air and the body through 70 sq m of man s pulmonary surface impels the investigation of the quantity of definite chemical molecules arriving at the alveolar membrane and the rate of penetration through it. Basic studies of solubility, diffusion, and physiological reactions are needed, especially concerning organic particles and metals which constitute potential health hazards. Kinetics of retention of pollutants should be established to determine permissible concentrations. Carbon monoxide load in acute or chronic exposure can be predicted since carboxyhemoglobin equilibrium can be quantified. But reliable data about penetration of most air pollutants alone or in combination as they generally exist in the environment are still lacking. (Author conclusions modified)

**40986** **APTIC NO. 64716**

Sumitomo, Baiya

EXAMINATION OF THE TOXICITY OF POLYURETHANE FOAM COMBUSTION GASES (WITH A REVIEW OF THE KIMMERLE REPORT). *(Poriuretan fomu nensho hassei gasu no--Kimmerle Report o chushin ni--yugaisei no kento). Text in Japanese. Purasuchikkusu (Japan Plast.), 25(7):11-22, July 1974. 20 refs.*

The effects of individual elements such as carbon dioxide, carbon monoxide, and hydrogen cyanide, emitted when polyurethane is burned or decomposed by heat, are well known, but the multiple effects of these gas compounds have not been known. Studies on the effects of these gases on experimental animals have been made in Germany, where efforts are being made to standardize the test material, exposure time, air supply quantity, temperature level, exposure chamber type, number of animals, and analytical and identification methods for such tests. In studies made by Kimmerle, CO and HCN concentration in the air, responses of experimental animals to exposure to compound gases from decomposing plastics, CO-hemoglobin level in animal blood, and mortality of the animals were observed. Mortality of rats per material per decomposition temperature was examined and the danger temperature was determined as the relative toxicity of that particular plastic material. Polyurethane foams of various types were smouldered at 400-600 C, and 20 rats were exposed to the combustion (decomposition) gas diluted with fresh air. With nonsaturated polyester resin reinforced with glass particles heated at 300 C, CO in the air was 250 ppm, HCN, O, and 7 out of 20 rats died. Their COHb was 6.4%. With ABS resin heated at 400 C, CO was 350 ppm, HCN 150, and 13 out of 20 rats died with COHb 14.2%. With polycarbonate resin heated at 600 C, CO was 24,000 ppm, HCN, O, and all 20 rats died with COHb 71.5%. Thermodecomposition effects of other materials such as cork, pine wood, coconut fiber, latex foam, wool, cotton, rubberized hair, etc. were also investigated. Latex foam heated to 200 C caused the death of 14 rats of 14 rats out of 20, with COHb 13%.

**40987** **APTIC NO. 64826**

Takeuchi, Fumiko, Yasuko Yoshida, Yasuko Miura, Yoshiko Syozawa, and Miwa Mikami

THE STATISTICAL OBSERVATION ON RESPIRATORY INPATIENTS IN OUR CLINIC. *(Toka ni okeru kokyuki nyuin kanja ni tokeiteki kansatsu). Text in Japanese. Tokyo Joshi Ika Daigaku Zasshi (J. Tokyo Women s Med. Coll.), 44(4):347-351, April 1974. 10 refs.*

Statistical observations are given for respiratory inpatients received at a Japanese clinic during the period of 1963-1972. Respiratory cases accounted for 1176 admissions out of a total of 5016 inpatients, with 664 male and 512 female. Pulmonary tuberculosis accounted for one third and pneumonia for one-fourth, with bronchial asthma, lung cancer, bronchitis, pleuritis, and spontaneous pneumothorax accounting for lesser amounts in decreasing order. Respiratory cases over the last 5 years of the period increased by a factor of 2.6 as compared to the former 5 years. Patients under 39 years of age were more numerous than those older, and male admissions were four times as frequent as female.

**40988** **APTIC NO. 64846**

Tsukiori, N., S. Yaguchi, T. Kobayashi, K. Sakai, T. Date, A. Fukuda, and M. Takada

ENZYMATIC AND HISTOPATHOLOGICAL STUDIES OF MICE EXPOSED TO SULFUR DIOXIDE. *(SO2 bakuro mausu ni okeru koso kassei no hendo to hai byori soshikigaku-teki kento). Text in Japanese. Nippon Kyobu Rinsho (Japan. J. Chest Diseases), 33(5):346-352, May 1974. 21 refs.*

Swiss albino mice with a body weight of 20-30 g were exposed in groups of six to 10 animals to an average concentration of 80 ppm of sulfur dioxide daily for 1 hr in the morning and for 1 hr in afternoon during 23, 39, and 48 days. After exposure they were sacrificed and blood, lung, and liver were examined for beta glucuronidase activity and acid phosphatase activity. The serum acid phosphatase activity increased remarkably even in the animals exposed for 23 days. Serum-beta-glucuronidase activity initially decreased after 23 days, and then returned to normal after 39 days, with a small significant increase after 48 days exposure. Lung acid phosphatase activity showed the same pattern; however, it was not as marked. Lung beta-glucuronidase activity showed the same tendency with large fluctuation after 48 days exposure. Liver acid-phosphatase activity showed a somewhat different pattern from those in the serum and lung with a decrease after 23 days exposure, partial recovery after 39 days, and a complete recovery after 48 days exposure. Liver-beta- glucuronidase activity showed the same pattern as those in serum and lung beta-glucuronidase. After 23 days, bronchitic symptoms appeared. After 43 days exposure, thinning of alveolar walls, fusion and enlargement of alveoli with stagnation, pulmonary emphysematic symptoms and bronchitic pneumatic symptoms appeared. After 48 days exposure, inflammatory symptoms with regeneration of alveolar epithelium, degradation of vessel walls and infiltration of leucocytes around the degraded walls occurred.

**40989** **APTIC NO. 63153**

Vysochina, I. V., I. K. Konstantinova, and N. N. Skvortsova

THE EFFECT OF SULFUROUS GAS ON THE GLYCOGENOLYSIS IN THE LUNGS AND LIVER. *(Vliyaniya sernistogo gaza na glikogenoliz v legkikh i pecheni). Text in Russian. Gigiena i Sanit., no. 4:3-6, 1974. 11 refs.*

The chronic action of sulfur dioxide (10 mg/cu m) on the glycogenolysis of the lungs and liver of albino rats was studied. The action of SO2 on the lungs consisted of a sharp fall in the adeninnucleotides content, increase of the amount of lactic acid, and activation of the anaerobic glycogenolysis in the homogenate of this tissue. The investigated dose of SO2 had no effect on the anaerobic glycosis of the liver of experimental animals. However, it inhibited the aerobic glycogenolysis in the homogenates of both tissues.

**40990** **APTIC NO. 64780**

Wada, O., Y. Yano, S. Ono, S. Nagahashi, and K. Toyokawa

A STUDY ON THE METHOD OF EVALUATING EXPOSURE TO LEAD - SELECTION AND EVALUATION OF VARIOUS INDICES CONCERNING THE DEGREE OF EXPOSURE TO LEAD. *(Namari bakuro no hyokaho ni kansuru kenkyu - namari bakuro no teido to kakushu no shihyo no sentaku to hyoka). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 29(1):143, April 1974.*

The lead content in blood and urine, the activity of delta-aminolevulinic acid dehydrogenase in peripheral blood, and delta-aminolevulinic acid and coproporphyrin in the urine was tested in five groups of subjects: 12 male workers with symptoms, 12 male workers severely exposed to lead but without any symptoms, 20 male workers slightly to moderately exposed to lead, 40 male inhabitants who have lived in the center of the city for more than 3 years and 39 male inhabitants who have lived in rural area for more than three years. Correlations of these values were studied. Blood lead and the activity of delta- aminolevulinic acid dehydrogenase showed a significant difference between the average values of all the five groups. Lead, delta-aminolevulinic acid coproporphyrin in urine, and Hb showed a significant difference between the average values of lead workers groups. Lead in the blood and the activity of delta-aminolevulinic acid dehydrogenase showed negative correlation in all the groups. Lead and delta-aminolevulinic acid in urine showed a positive correlation in lead workers groups. Coproporphyrin and Hb showed no correlation. The activity of delta-aminolevulinic acid dehydrogenase showed negative correlations to lead and delta-aminolevulinic acid in urine. In workers without occupational contact with Pb, only blood lead showed a correlation with the dehydrogenase. Lead in blood and urine and ALA are most pertinent in highly to moderately exposed persons to lead, and lead in blood and the activity of the dehydrogenase in very slightly to slightly exposed are most pertinent for evaluating the degree of exposure to lead.

**40991** **APTIC NO. 63159**

Watson, L., R. B. Knox, and E. H. Creaser

CON A DIFFERENTIATES AMONG GRASS POLLENS BY BINDING SPECIFICALLY TO WALL GLYCOPROTEINS AND CARBOHYDRATES. *Nature (London), 249(5457):574-576, June 7, 1974. 17 refs.*

Airborne grass pollens are a major cause of hayfever. The allergens involved are mostly proteins and glycoproteins which are stored in pollen walls and are rapidly released on moistening. The capacity of certain plant lectins to bind specific carbohydrates and glycoproteins and to form precipitates with them in double diffusion tests is a means of investigating these substances in pollen. The way the concanavalin A (con A) lectin from jack beans differentiates among grasses by specifically precipitating wall-held materials from pollens mainly of nonfestucoid species where studied. Double diffusion tests were used to screen grass pollen from 42 species for materials precipitating with con A. Pollen of corn and its closes relatives was easily distinguishable from that of other grasses by its characteristic reactions with con A.

**40992** **APTIC NO. 64442**

Yokoyama, E.

ON THE MAXIMAL EXPIRATORY FLOW VOLUME CURVE OF RABBIT LUNG EXPOSED TO OZONE. *(O3 bakuro kato-hai no saidai koshutsuji kiryu ryo - kiryu kyokusen). Text in Japanese. Nippon Kyobu Shikkan Gakkai Zasshi (Japan. J. Thoracic Dis.), vol. 12(Supple):2, March 1974. (Presented at the Japanese Society for Chest Diseases, Annual Meeting, 14th, Tokyo, Japan, April 2-3, 1974.)*

In order to detect obstruction of the peripheral airway, the maximum expiratory flow volume (MEFV) curves were determined on rabbits exposed to ozone at 1 ppm 6 hr/day for 7-8 days, and at 2 ppm 6 hr/day for 3-4 days. A body plethysmograph with an artificial ventilation of 30 times/min was used. Using the functional residual capacity (FRC) obtained before artificial ventilation, RV/TLC, FRC/TLC, RL, and CL on unexposed control rabbits were respectively 10.1%, 30.7%, 46.5 cm H2O/l/s and 0.0056 l/cm H2O. For rabbits exposed to ozone at 2 ppm, RV/TLC, FRC/TLC, and RL were more than those of the controls, and CL was lower than those of controls. On the animals exposed to ozone at 1 ppm the values were between those of control and 2 ppm group. The flow volume curve of 1 ppm was almost the same as that of the control, and the 2 ppm exposure group showed a tendency to translate the left direction at a pressure lower than 50 cm H2O. Regression analyses were performed. Exposure to nitrogen dioxide and sulfur dioxide were also described.

**40993** **APTIC NO. 64930**

Yokoyama, E.

AIR POLLUTANTS AND MUCOCILLIARY CLEARANCE. *(Taiki osen-shitsu to mucocilliary clearance). Text in Japanese. Igaku no Ayumi (Progr. Med.), 89(12):692, June 22, 1974. 6 refs.*

Airway infections aggravate any already existing respiratory diseases and a decrease of resistance to airway infections due to pollution is an important consideration in evaluating the health effects of air pollution. The effects of deep irritants such as nitrogen dioxide and ozone on the ciliary mechanism of phagocytosis by macrophages in the lung are discussed. Current research on the effects of air pollution on immunology is reviewed.

**40994** **APTIC NO. 63132**

Tokyo Metropolitan Bureau of Public Health (Japan)

THE NUMBER OF PATIENTS RECOGNIZED AS AIR POLLUTION HEALTH VICTIMS. *(Tiki osen kenko shogaisha ninteisu). Text in Japanese. 1p., March 31, 1974.*

According to this table of the Tokyo Metropolitan Bureau of Public Health, the total number of health impairment cases recognized as results of air pollution, as of March 31, 1974, are, among the 23 metropolitan districts, 144 chronic bronchitis cases, 6510 bronchial asthma cases, 3773 asthmatic bronchitis cases, and 1 case of emphysema, the total being 10,428. In other counties and cities of Tokyo including the islands, there are 75 cases of chronic bronchitis, 2172 cases of bronchial asthma, and 1284 cases of asthmatic bronchitis. The total number of air pollution victims in all of Tokyo is 13,959, including 219 from chronic bronchitis, 8682 from bronchial asthma, 5057 from asthmatic bronchitis, and 1 from emphysema.

**40995** **APTIC NO. 63259**

TOBACCO SMOKE AND THE NON-SMOKER. *Lancet, 1(7868):1201-1202, June 13, 1974. 39 refs.*

Tobacco smoking can affect nonsmokers as well as smokers. For example, cigarette smoking by pregnant women is associated with low infant birth-weight and increased perinatal mortality. This has been confirmed by studies of rats and humans. Maternal smoking can also cause increased bronchitis and pneumonia during the first year of the infant s life. It is possible that this is caused by inherited proneness to chest infection, contamination from the smoke, or increased transmission of infection from the smoking mothers who are more likely to cough. Investigations into the relationship between passive smoking and infant infections are inconclusive. Areas which are poorly ventilated may have quantities of noxious agents from tobacco smoke which exceed air quality standards. During extreme conditions combining heavy smoking and lack of ventilation, nonsmokers may experience acute irritation of the eyes and respiratory passages, headaches, or absorption of carbon monoxide and nicotine. The amount absorbed is well below levels which typically prevail in smokers over long periods. Passive smoking may cause other affects such as impairment of visual acuity or increased carboxyhemoglobin levels. Under ordinary conditions, concentrations of tobacco smoke in public places such as buses and planes do not reach harmful levels. Generally a nonsmoker becomes uncomfortable at levels far below those constituting a biological hazard and is able to take protective action such as breath-holding, opening a window, or leaving the room, thus avoiding higher, harmful concentrations.

**40996** **APTIC NO. 63338**

Kanagawa Prefectural Government (Japan), Pollution Control Bureau

PRESENT STATE OF PHOTOCHEMICAL AIR POLLUTION AND CONTROL MEASURES. *(Kokagaku kogai no genjo to taisaku). Text in Japanese. 78p., March 1974.*

The total number of people who were affected by photochemical smogs in 1973 in Kanagawa prefecture was 2526, consisting of 1509 in Yokohama, 435 in Ayase, 393 in Kawasaki, 57 in Atsugi, 56 in Yokosuka, 29 in Chigasaki, 25 in Odawara, 9 in Isehara, 7 in Kamakura, and 2 each in Fujisawa, Sagamihara, and Miura. The total number of incidents was 17 and about the same number as 1972, and Kawasaki was involved in more incidents than any other city, with six occasions. On the total 2526, 2143 were schoolchildren of various levels including 1392 junior high school pupils. They were mostly exercising outdoors. The adults who were affected were also walking or working out of doors. Some incidents occurred in rooms with open windows. An overwhelming number of cases involved irritation or pain in the eyes, lachrymation, sore throat, suffocation, and coughing. There were some headaches, heavy heads, and nausea, but all cases were temporary and no patient was hospitalized. The day with the highest number of victims (1447) had the highest level of oxidants. On July 13, the level went up to 0.30 ppm in Kawasaki. On the other days with incidents, the levels ranged between 0.22 and 0.29 ppm. On sunny or partially cloudy days, when the maximum temperature was more than 25 C, and visibility is less than 10 km, incidents occurred most frequently.

**40997** **APTIC NO. 64443**

Miyagi Prefectural Office (Japan)

RESULTS OF INVESTIGATION ON THE EFFECTS OF AUTOEXHAUST TO INHABITANTS IN AN AREA. *(Jidosha haishutsu gasu ni yoru chiju jumin no eikyo chosa kekka). Text in Japanese. Miyagi-ken Kogai Shiryo (Data Public Nuisances, Miyagi Prefect.), no. 10:69- 102, Jan. 1974.*

An investigation of the effects of autoexhaust on humans was carried out at each main point of Ishinomaki and Furukawa cities, along with the survey of air pollution there in Sept. 1972. In Ishinomaki city, 38 men and 32 women from the center of the city had a red blood count (RBC) of 4.350 million/cu mm (men) and 3.930 million/cu mm without any abnormal value. The serum globulin of whole blood was 1.056 (men), and 1.051 (women) with four persons whose s.g. was less than 1.048. The hemoglobin was 14.5 g/dl (men) and 12.5 g/dl (women) at the median, without any abnormal distribution. The average value of lead content of blood of 11 men and of 10 women randomly selected from total 70 persons was respectively 22.2 micrograms/dl and 16.7 micrograms/dl, without any abnormality as groups or as individuals. No positive findings were observed in qualitative urinalysis for coproporphyrin. The respiratory resistance value average was an abnormal of 3.6 (men) and 4.0 cm H2O/l/sec (women). The data of autotraffic and values of carbon monoxide, nitrogen oxides, floating dust, and lead in the air was, respectively, 594-928 cars/hr, 9.1 ppm (2.1-19.3 ppm), 2.6 ppm of nitric oxide (max. 8.5), 3.2 ppm of nitrogen dioxide (max. 6.3), 0.7-1.10 mg/cu m, and 0.93 micrograms/cu m (0.69-1.10). In Furukawa City, 36 men and 40 women whosed comparable values on the same items of Ishinomaki City, each showing no abnormality. The traffic data and values of pollutants were slightly larger than those in Ishinomaki City.

**40998** **APTIC NO. 64756**

Kanagawa Prefecture (Japan) Bureau of Environmental Protection

A REPORT ON THE SURVEY AND INVESTIGATION ON PHOTOCHEMICAL SMOG INJURIES. *(Kokagaku* *kogai ni kansuru chosa kenkyu kekka no hokoku). Text in Japanese. Kanagawalken Taiki Osen Chosa Kenkyu Hokoku (Tech. Rept. Air Pollution Yokohama-Kawasaki Ind. Area), no. 16:169-179, Feb. 1974.*

The effects of smog on humans were studied. Men were exposed to 0.02-0.3 ppm ozone for 30 min. Photochemical smog injuries occurring in Yokohama, Yokosuka, Kamakura, Zushi, and Kawasaki were also studied. During the smog episodes, respiratory and circulatory symptoms occurred as well as some eye irritation, general feelings of ill health, and headaches. In the laboratory exposure to ozone, respiratory function was generally suppressed when the men were at rest, and exercise caused accentuation of respiratory function. No large change in heart function was noted.

**40999** **APTIC NO. 64802**

Yokohama Municipal Univ. (Japan), Faculty of Medicine, and Bureau of Environmental Protection (Japan), Yokohama City Office

AN EPIDEMIOLOGICAL STUDY ON THE EFFECT OF AIR POLLUTION ON INFANTILE LUNG FUNCTION. *(Taiki osen no yoji no hai kino ni oyobosu eikyo ni tsuiteno ekigakuteki kenkyu). Text in Japanese. Kanagawaken Taiki Osen Chosa Kenkyu Hokoku (Tech. Rept. Air Pollution Yokohama-Kawasaki Ind. Area), no. 16:96-112, Feb. 1974. 3 refs.*

Lung function was comparatively investigated on 177 children of A kindergarden located in non polluted Ward and on 138 children of K kindergarden in a polluted Ward in Yokohama City in 1972; the age distributions of the kindergardens were 10, 79 and 88, and 18, 54, and 66 respectively, in A and K kindergardens of 4-, 5-, and 6-year olds. The findings on lung function examination are given. The peak flow values of children in both kindergardens showed nearly normal distribution. Values of peak flow, body height, body weight, and girth of the chest of children in A kindergarden were higher than those in K kindergarden, however, the statistically higher values were found in peak flow and body height except for 5-year girls and in girth of the chest except for 6-year old girls. Significant correlation was found between peak flow value and body height, the former and body weight, and the former and girth of the chest. The same investigation was also carried out on 56 children of a kindergarden in Yokosuka City, two times/day for consecutive 6 days, to see the daily, time wise, and individual fluctuation. Significant individual and time-wise fluctuations were found on boys, and significant daily, individual, and time-wise fluctations were found on girls.

**41000** **APTIC NO. 64803**

Yokohama Municipal Univ. (Japan), Faculty of Medicine; Medical Assoc., Yokohama (Japan); and Yokohama Municipal Asahi Medical Center (Japan)

STUDIES OF RESPIRATORY FUNCTION BY FLOW-VOLUME CURVES, PART I. THE COMPARISON OF RESPIRATORY FUNCTION BETWEEN THE INHABITANTS IN KANAGAWA WARD AND ISOGO WARD, YOKOHAMA CITY. *(Flow-Volume kyokusen ni yoru kokyu kino no kenkyu: dai ippo- Yokohama-shi Kanagawa-ku to Isogo-ku no jumin no kokyu kino no hikaku). Text in Japanese. Kanagawa-ken Taiki Osen Chosa Kenkyu Hokoku (Tech. Rept. Air Pollution Yokohama-Kawasaki Ind. Area), no. 16:85-95, Feb. 1974. 11 refs.*

The respiratory function was comparatively examined on the inhabitants of Koyasu area in Kanagawa Ward (253 persons) and of Isogo Ward (369 persons) in Yokohama. The amount of dust fall and the sulfur dioxide concentration of the areas were respectively 15 and 9-13 t/sq km/mo (1970) and 0.5-0.8 and 0.3-0.5 mg sulfate/100 sq cm/day. The findings on males were: V75, V50, V25, and V10; the maximum expiration velocity, and those values per height, body weight, and body surface area (BSA) were significantly larger in Isogo than those in Koyasu, except for V75/body surface area and vital capacity and forced expiratory volume were stochastically higher in those in Isogo Ward. The findings on females were: maximal expiration velocities were statistically higher in those in Isogo Ward except for V75/BSA, and V50, V25, and V10 and those values per height, body weight, and BSA were significantly higher in those in Isogo Ward. The V75/V25 and V50/V25 were staticially higher than those in the Koyasu area both in males and in females. The % vital capacity of those in Koyasu was lower than that of those in Isogo in all ages and in every 10 ages from thirty to seventy.

## 1973

**41001** **APTIC NO. 62945**

Creason, John, P., Douglas I. Hammer, Lamar Priester, Janet Davis, and Anthony V. Colucci

BLOOD COPPER, ZINC, LEAD AND CADMIUM LEVELS IN A POPULATION OF MILITARY RECRUITS. *Prepint, American Public Health Association, 22p., 1973. 10 refs. (Presented at the American Public Health Association, Annual Meeting, 101st, San Francisco, Calif., Nov. 1973.)*

Medical questionnaire data concerning age, race, smoking habits, residential history, and educational attainment, along with data obtained from blood analyses for copper, lead, zinc, and cadmium are presented for 2000 military recruits undergoing physical examinations at the Chicago Induction Center during the period June 24, 1969 to February 20, 1970. Mean blood levels for copper and zinc were generally comparable to published values, while cadmium and lead values were somewhat higher than previous reports. Lead and copper levels were significantly higher in the blacks, and copper levels were higher in cigarette smokers than nonsmokers. Subjects were classified as urban Chicago, suburban Chicago, and outstate Illinois, and further classified by length of residence in these areas. Significant differences for copper, lead, and zinc appeared across areas for subjects in residence for 2 years or more, though the cause for the observed differences across areas was not determined.

**41002** **APTIC NO. 63041**

DeBias, Domenic A., C. M. Banerjee, N. C. Birkhead, W. V. Harrer, and L. A. Kazal

CARBON MONOXIDE INHALATION EFFECTS FOLLOWING MYOCARDIAL INFARCTION IN MONKEYS. *Arch. Environ. Health, vol. 27:161-167, Sept. 1973. 9 refs.*

Normal monkeys and monkeys with induced myocardial infarction were continuously exposed to 100 ppm carbon monoxide for 24 weeks with evaluation of the physiologic effects on the cardiovascular system in order to test the hypothesis that human patients with heart disease, unlike normal individuals, may not be able to compensate for decreased oxygen availability resulting from 10-15% carboxyhemoglobin. Significant and persistent characteristic elevations in the hematocrit, hemoglobin, and red blood cell count were observed after three weeks of exposure in both noninfarcted and infarcted animals. Electrocardiograms of infarcted and noninfarcted animals inhaling the CO displayed increased P wave amplitudes. The incidence of T wave inversion was higher in infarcted than in noninfarcted animals, indicating a greater degree of myocardial ischemia in the infarcted animals breathing CO.

**41003** **APTIC NO. 64441**

Furuuchi, I.

ON THE AIRWAY DISEASES CAUSED BY AIR POLLUTION. *(Taiki osen ni yoru kido shikkan ni tsuite). Text in Japanese. Nihon Kikan Shokudoka Gakkai Kaiho (J. Japan Broncho-Esophagological Soc.), 24(5):243, Oct. 1973.*

Clinical examinations were conducted mainly on the relationship between the hypersensitivity of the nasomucosa and air pollution on outpatients with airway diseases. In the cases of adults who complained of a foreign feeling on the pharynx and pharyngeal ache, many patients showed a high decrease of hypersensitivity; the decrease and disappearance of the normal filtrating function of nasal mucosa resulted in the compensative burden on the pharynx with the observation of granules and lateral fasciculus on the pharynx and hypertrophy of tonsilla lingualis. These symptoms occurred in long lived persons in polluted air, workmen in polluted workshops, heavy smokers, patients with atrophic rhinitis, and those who had nasal sequela or had their tonsils removed. In old people many complained of cough, sputum, and sometimes dyspnea. A high decrease of hypersensitivity of nasal mucosa was noticed. Physiological decrease of nasomucosal hypersensitivity and weakening of the compensatory function of the pharynx had occurred. Therefore, several pollutants and stimulants directly attack the lower airway and tracheal mucosa. Many patients with decreased hypersensitivity of nasal mucosa who had pathological findings on the nasal mucosa showed atrophic pathological symptoms showing the destruction of filtering protective mechanism of the nasal mucosa. These circumstances show the possibility of causing more severe respiratory diseases when some infection attacks the patients, especially the old people.

**41004** **APTIC NO. 64670**

Hayashi, Yutaka

AN EXPERIMENTAL STUDY ON THE EFFECTS OF SULFUR DIOXIDE ON THE METASTASIS OF LUNG TUMORS. *(Aryusan gasu no shuyo-hai teniso ni oyobosu eikyo ni kansuru jikkenteki kenkyu). Text in Japanese. In: Investigation of Air and Water Pollution on Human Health. Chiba Prefectural Government (Japan), Dept. of Hygiene, p. 101- 102, May 1973.*

The effect of sulfur dioxide on metastatic tumor lesions in the lung was investigated. To form metastatic tumor lesions, 29 male rats out of 36 were inoculated with Walker 256 tumor cells (300 million cells). After 3 to 9 days, 14 inoculated rats were subjected to inhaling SO2 gas (120 ppm, 5 hrs) once a day for two days. The other 15 inoculated rats were left as a control group. Seven normal rats not inoculated were subjected to inhaling SO2 in a similar manner to investigate the effect of SO2 inhalation on lung. After 7 to 19 days rats were killed, and lungs and bronchi were histologically examined. In the inoculated group, the incidences of metastasis in the SO2 group and the group without SO2 inhalation were similar. However, the visually determined size of metastatic lesion was larger in the case of the SO2 group, and a few cases of metastasis to heart sac and lung wall were observed in the SO2 group. The histological study of metastasis of both groups showed morphological differences. The SO2 gas promotes infiltration of metastatic tumor lesions in the lung, which is probably attributable to disorders in lung tissue caused by the gas.

**41005** **APTIC NO. 64933**

Hayashi, Y., D. Ogata, H. Owada, and A. Sugibayashi

PATHOLOGICAL FINDINGS ON THE RESPIRATORY SYSTEM OF DOMESTICALLY BRED DOGS IN AIR POLLUTED REGIONS: THE EFFECTS OF LUNG DISTURBANCES CAUSED BY INHALED SO2 ON THE PROLIFERATION OF METASTASIZED CANCER FOCI IN THE LUNG OF RAT. *(Taiki osen chiku ni okeru shiiku-ken no kokyuki no byori gakuteki shoken; aryusan gasu kyunyu ni yoru hai shogai no gan teniso no zoshoku ni oyobosn eikyo ni tsuite). Text in Japanese. Chiba Daigaku Kankyo Kagaku Hokoku (Rep. Environ. Res. Organ. Chiba Univ.), 1(1):63- 67, July 1973. 9 refs.*

Forty-five domestically bred dogs in an air polluted region of Fuji City (concentration of sulfur dioxide 0.03-0.064 ppm) were histopathologically examined as compared to nine dogs in a relatively non-polluted region (concentration of SO2 less than 0.014 ppm). In 39 out of 45 cases a proliferation of epithelial basal cells was found on trachea and bronchus, especially noticeable in dogs living in the region more than 4 years. In 38 out of 45 cases inflammatory cell infiltration was recognized on the walls of trachea and bronchi. In 38 cases, pulmonary emphysema having lobules as a center was seen in the lung parenchyma. Sedimentation of carbon dust was not as heavy in the region where the amount of falling dust was small, even with a high concentration of SO2. After 3-9 days of injecting 300 million tumor cells into male rats, the rats were exposed to SO2 at 120 ppm, 5 hr/day after 2 consecutive days. Although minute matastatic foci were also found in the control animals, the tendency of proliferation of infiltration of metastasized foci in the lung was accentuated by the inhalation of SO2.

**41006** **APTIC NO. 62987**

Hoover, A. Walter and Robert M. Albrecht

THY USE OF PANELISTS AS SUBSTITUTES FOR TAXICAB DRIVERS IN CARBON MONOXIDE EXPOSURE (FINAL REPORT). *Columbia Univ., New York, Div. of Environmental Health Sciences, Environmental Protection Agency and Coordinating Research Council, Inc. Contract CPA 22-69-97 and CAMP-8-68(1-68), Program Element 1AA005 and 21AFU, Rept. EPA-650/1-74-001, 36p., July 1973. 8 refs.*

NTIS: PB 228783/AS

Analyses of breath and limited blood samples from 30 pairs of taxi drivers and panelists who drove in New York City traffic for 8 hrs on two consecutive days indicated that both panelists and drivers attained similar carboxyhemoglobin levels. This was true for both smokers and non-smokers, though smokers had significantly higher concentrations of COHb than nonsmokers. There was no consistent difference between the first and second day of driving in the levels of alveolar carbon monoxide. (Author summary)

**41007** **APTIC NO. 63364**

Ichihara, Masamichi

OBSERVATIONS ON THE EFFECTS OF ATMOSPHERIC LEAD CONCENTRATION ON LIVING ENVIRONMENT. *(Seikatsu kankyo to shite no taiki chu ennodo no hyoka ni kansuru ichikosatsu). Text in Japanese. Yokohama Igaku (Yokohama Med. J.), 24(1):9-23, Feb. 1973. 40 refs.*

Medical examinations were made of 1368 persons living near a glass factory in order to determine the effects of lead air pollution. No one was suffering from lead poisoning. Biological factors like sex and age had considerable impact on blood findings, except for blood lead content. Environmental factors were not closely involved. No significant statistical differences in blood lead and urine coproporphyrin were observed from the point of view of sex, distance from the factory, age, length of residence, or occupation. No statistical differences in urine lead were noted from the point of view of age, length of residence, occupation; significant differences were apparent as far as sex and distance from the factory were concerned. Artificial contamination was present in urine samples of females, therefore, the present evaluation is not very significant. The degree of atmospheric lead concentration was comparatively high within a radius of 300 m from the factory. The level of concentration varied from 1.4 to 14.8 micrograms/cu m. The upper limits of reliable range of population mean were 14.5 micrograms/cu m for a reliability factor of 99%, and 11.5 micrograms/cu m for a reliability of 95%. Blood and urine lead as well as urine coproporphyrin did not increase even for average atmospheric lead concentrations of 12-15 micrograms/cu m over a period of at least 12 years.

**41008** **APTIC NO. 64671**

Ide, Genshiro and Hiroshi Otsu

A STUDY ON THE CARCINOGENIC ACTION OF POLLUTANTS. *(Taiki osen busshitsu no hatsugan sayo ni kansuru kenkyu). Text in Japanese. In: Investigation of Air and Water Pollution on Human Health. Chiba Prefec-*

*tural Government (Japan), Dept. of Hygiene, p. 99-100, May 1973.*

In mice inhaling 0.5-1.0 ppm nitrogen dioxide for 1 mo, the cell proliferation at the peripheral bronchi and increased lymph follicles at the peripheral bronchi and pulmonary trunk are observed. To further investigate the nature of such proliferations, the synergistic effect of NO2 administered with carcinogen was investigated. Test mice were exposed to 5-10 ppm NO2 for 2 hr/day, 5 days/wk, for 50 wk. The carcinogen 4NQO was administered subcutaneously as a 0.1 ml dose of 0.25% olive-oil cholesterol solution. Four test groups included a group treated with NO2 and 5 injections of 4NQO (NO2 + 4NQO by 5), a group treated only with 5 injections of 4NQO (4NQO by 5), a group treated only with NO2 (NO2), and a blank group. The incidence of pulmonary tumor in the (NO2) group was similar to that of the blank group, and considerably lower compared to that of the other test groups, indicating that NO2 inhaled was not likely to induce tumors. The incidences of tumor in (NO2 + 4NQO by 5) group and (4NQO by 5) group were similar, indicating that a synergistic effect of NO2 is unlikely.

**41009** **APTIC NO. 64906**

Imai, Masayuki, Hidehiko Oshima, Tokiko Kawagishi, Kushuo Banno, Katsumi Yoshida, and Masayoshi Kitabatake

THE EPIDEMIOLOGICAL STUDIES ON THE EFFECTS OF AIR POLLUTION TO HIGH SCHOOL STUDENTS IN YOKKAICHI. *(Taiki osen no kokosei ni oyobosu eikyo ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(5):703-709, Dec. 1973. 7 refs.*

An epidemiological study was performed on high school students in Yokkaichi to determine the physiological consequences of an air pollution episode which had occurred 10 years prior to the study. Data were collected for the following: prevalnce of such symptoms as ocular pain, red eyes, discharges from the eye, lachrymation, sore throat, throat dryness, rhinorrhea, nose obstruction, and nausea and headache for each district; prevalence of cough and phlegm; prevalence of asthmatoid attack; past medical history; school absence rate; bronchial asthma prevalence; and correlation between sulfur dioxide concentration and prevalence of bronchial asthma. The results indicated that a greater proportion of students with histories of chronic bronchitis and asthmatic bronchitis during childhood exhibited favorable progress as compared to older age groups, although a portion of the students with bronchial asthma showed unfavorable progress. Prevalences of chronic bronchitis and asthmoid attack were not much different in polluted and non-polluted areas.

**41010** **APTIC NO. 64847**

Ishii, Tadashi

ON THE AIR POLLUTION AND THE HEALTH STATE OF IWAKI CITY. *(Iwakishi no taiki osen to jumin no kenko ni tsuite). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):175-190, Oct. 1973. (Presented at the Japan. Society of Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

Iwaki city is located on the northeastern Pacific coast and has 325,610 inhabitants. In an area of 1228 sq km, two coal mines, two industrial zones, an industrial seaport, agricultural fields, and mountainous regions exist. The air pollution of the city began with the installation of a chemical factory emitting sulfur dioxide causing damage to all the pine trees on the Pacific coast and causing problems in the eyes and respiratory systems of inhabitants near the factory. The physicians of the city have organized a society for studying industrial pollution to protect the health of the inhabitants. Investigations on the morbidity on chronic bronchitis, bronchial asthma, pulmonary emphysema, and their complications are being conducted. The morbidity of the above-mentioned diseases is 3.2% in men and 2.3% in women. Until now, health examinations on inhabitants were carried out in the seashore industrial region of the city, the items of examination being the diseases possibly caused by cadmium and the effects of SO2 on the health. The percentage of morbidity in one industrial zone was 4-8% and 3-4% in another industrial zone, contrasted to the 2% in an unpolluted zone.

**41011** **APTIC NO. 64722**

Matsuoka, A., H. Katsuki, and S. Watanabe

RESULTS OF THE INVESTIGATION OF MALIGNANT LUNG TUMORS IN KEIYO INDUSTRIAL ZONE, ESPECIALLY FROM THE MASS EXAMINATION OF INHABITANTS IN ICHIHARA CITY FOR LUNG CANCER. *(Keiyo kogyo chitai ni okeru hai akusei shuyo no hassei ni kansuru chosa (tokuni Ichihara-shi jumin no haigan shuken kara)). Text in Japanese. Chiba Daigaku Kankyo Kagaku Hokoku (Rep. Environ. Res. Organ. Chiba Univ.), 1(1):57-62, July 1973.*

Ichihara city is divided into an industrially air-polluted coast line and a non-polluted inland area which have 121,[illegible]07 and 47,173 inhabitants with a morbidity of chronic airway diseases (except tuberculosis) of 0.15 and 0.18%, respectively in 1971. The morbidity of such diseases in infants was larger in the air polluted part and on older persons was larger in non-polluted part both in 1970 and 1971. X-ray examinations of patients with varying degrees of disease showed that the number of persons yearly examined decreased from 42,528 in 1958 to 29,265 in 1971, totaling 502,059, and of them the number of people with acute manifestations totaling 176. The number of confirmed cases of lung cancer ranged from two to seven totaling 65. Morbidity of acute cases increased slightly with age and degree of air pollution, but no definite conclusions could be drawn.

**41012** **APTIC NO. 64869**

Mizutani, N. and M. Iwakura

AIR POLLUTION AND TRACHEAL HYPERSENSITIVITY. *(Taiki osen to kido kabinsei). Text in Japanese. Nihon Kikan Shokudo ka Gakkai Kaiho (J. Japan. Broncho. Esophagolog. Soc.), 24(5):241, Oct. 1973. (Presented at the XXV Annual Meeting of the Japan Bronch- Esophagological Society.)*

The mode of response of chronic obstructive lung disease to inhaled acetylcholine and its significance with respect to differential diagnosis of tracheal hypersensitivity were investigated. The one second-volume before and after inhalation of 1000 micrograms of acetylcholine was determined in patients of chronic obstructive lung disease to determine the values a, b, and c, where the difference (c-b) is the differential of one second-volumes and a is the presumed vital capacity. When the value 100(c-b)/a greater than or equal to 15% is defined as positive, the positivity percentage in unpolluted areas becomes 68% for bronchial asthma, 15% for chronic bronchitis, and 60% for pulmonary emphysema. The result includes many false positive cases of emphysema, making the differential diagnosis of chronic obstructive lung disease difficult. However, when the value 100(c-b)/a greater than 10% is defined as positive, the positivity percentage for bronchial asthma is 60%, for chronic bronchitis 3%, and for pulmonary emphysema 9%, suggesting the usefulness of the method fof differential diagnosis. The results using this criterion in polluted and unpolluted areas are given. After consideration of tracheal hypersensitivity of cases of bronchial asthma in polluted and unpolluted areas by combining the sex, age, age of onset, relative vital capacity and one second-volume, the cases of the criterion being larger than 10% were the same in both areas (60%). However, the average of the criteria showed that tracheal hypersensitivity was a little less in the polluted area than in the unpolluted area. No correlation was found between immunoglobulin E and tracheal hypersensitivity.

*41013* **APTIC NO. 63278**

*Motomiya, Takeshi, Kozo Ito, Ryo Yoshida, Genshiro Ide, Hiroshi Otsu, and Yasutomo Nakashima*

*THE EFFECTS OF EXPOSURE TO EXHAUST GAS AND OXIDANT ON THE RESPIRATORY AIRWAY. (Haiki gasu oyobi okishidanto bakuro no kido ni oyobosu eikyo). Text in Japanese. Chiba Daigaku Kankyo Kagaku Kenkyu Hokoku (Rept. Environ. Res. Organ., Chiba Univ.), 1(1):21-25, July 1973.*

Groups of mice were exposed to 0.1-0.15 ppm and 0.1-0.5 ppm of total oxidants, or automotive exhaust gas with 40-60 ppm of carbon monoxide content for 2-3 hours/day for one month respectively, and the patholohistological changes in the respiratory system were observed. The exposure chamber had an artificial photochemical oxidant formation device utilizing blacklight ultraviolet and fluorescent light. In order to obtain high concentrations of oxidant quickly, 2 ml of pure nitric oxide and 20 ml of propylene gas were added to a normal exhaust gas in the irradiation chamber. This made it possible to obtain 0.5-0.6 ppm of total oxidant in 30 min. The levels of hydrocarbon and CO were constantly monitored. The control group and the experimental groups when not being exposed to gases were all raised in clean air chambers. After the experiment, they were all killed and H.E. dye, elasticum dye, PAS reaction, Azan Mallory dye, van Gieson dye, and silver plating dye were applied to study cytological changes. During the exposure, there was no weight differences among the groups. Patholohistological changes were recognized on the viscous membranes of both oxidant and CO gas exposure groups, and bronchial epithelium proliferation was noted. This phenomenon was recognized on relatively large bronchi of seven out of 10 mice exposed to oxidant, and on peripheral bronchi of 11 out of 15 mice exposed to CO.

**41014** **APTIC NO. 63279**

Motomiya, Takeshi, Kozo Ito, Ryo Yoshida, Genshiro Ide, Hiroshi Otsu, and Yasutomo Nakashima

THE EFFECTS OF EXPOSURE TO NO2 GAS ON THE INFECTION OF INFLUENZA VIRUS OF MOUSE--LONG TERM EXPERIMENT IN LOW CONCENTRATION. *(NO2 gasu bakuro ga mausu no Influenza Virus ni oyobosu eikyo--choki teinodo jikken). Text in Japanese. Chiba Daigaku Kankyo Kagaku Hokoku (Rep. Environ. Res. Organ. Chiba Univ.), 1(1):27-33, July 1973. 33 refs.*

Four-week old mice were exposed to 0.3-0.5 ppm of nitrogen dioxide continuously for three and six months each. The experimental groups were an NO2 exposure group and a group that was exposed to influenza virus after an exposure to NO2 gas. The control group was exposed only to influenza virus. The effects of NO2 on the respiratory system of mice and the susceptibility to influenza virus were patholo-histologically studied. During the exposure to NO2 there was no special weight differences among the groups. After the experiment, group 2 was exposed to influenza virus, the group began to show a notable weight loss. In this group, the peripheral bronchial epithelial cells showed papillary increase and extreme adenomatosic proliferation. Around the bronchi and the blood vessels lymphatic folliculi increase, nodule increase, and lymphatic papillary increase were noted, and the morbidity was higher in proportion to the length of exposure to NO2. The control group had some light interstitial pneumonia and proliferation of lymphatic cells. The group exposed to virus after the NO2 exposure had much higher morbidity of interstitial pneumonia and lymphatic cell proliferation. The degree of infection and frequency was proportionate to the length of the NO2 exposure.

**41015** **APTIC NO. 63045**

Quadling, C., R. M. D. Sutton, and N. Khan

PROBLEMS AND SELECTION OF TOPICS FOR COMPILATION CAUSE/EFFECT DATA. REPORT NO. 1 OF THE SUBCOMMITTEE ON BIOLOGICAL PHENOMENA. *National Research Council of Canada, Ottawa, Div. of Biological Sciences, Rept. BY72-6(ES), NRCC 13080, 51p., Jan. 1973. 69 refs.*

Problems and the selection of topics are described for quantitative cause/effect relationships between organisms and pollutants which degrade environmental quality. The topics covered relate both directly and indirectly to human health and include: the release of feces, sewage, domestic, and biological wastes; land clearance or flooding, intensive agriculture; transportation of organisms; release of chemical agents, chemical industrial wastes, pesticides, and radioactive compounds; selected problems attributable to concentration of human populations; and problems attributable to biological agents normally present in the environment. Environmental problems directly related to human health covered by the report include: the spread of disease via the inhalation of atmospherically-dispersed microorganisms, increased incidence of allergies attributable to atmospherically dispersed allergens, and problems attributable to the presence of pesticide residues.

**41016** **APTIC NO. 62909**

Rabinowitz, Michael, George W. Wetherill, and Joel D. Kopple

LEAD METABOLISM IN THE NORMAL HUMAN: STABLE ISOTOPE STUDIES. *Science, 182(4113):725-727, Nov. 16, 1973. 9 refs.*

Kinetic and metabolic balance studies in a healthy man fed a diet normal in lead content and labeled with lead(204) indicated that approximately 1/3 of his assimilated lead was dietary in origin. The remainder of the lead was inhaled. Kinetic analysis showed that the isotopic data could be interpreted by a three-compartment model. Compartment one can be considered to be primarily blood and some soft tissues which exchange rapidly with blood. Compartment two includes primarily soft tissue and possibly the more actively exchanging parts of the skeleton. Compartment three includes the skeleton, which contains most of the lead in the body and the remainder of the soft tissue. The net dietary intake of lead was 25 micrograms/day. Mean urinary excretion of lead was 38 micrograms/day, and loss of lead from hair, nails, and sweat was approximately 4 micrograms/day. Thus, lead output exceeding dietary input was 17 micrograms/day from the atmosphere. Of this, about 1 microgram/day came from tobacco and the remainder probably from the exhaust of leaded gasoline.

**41017** **APTIC NO. 63077**

Schieler, Leroy

RELATIONSHIPS BETWEEN AIR POLLUTION AND HUMAN MENTAL DEPRESSION. *Preprint, American Chemical Society, Washington, D. C., 7p., 1973. 4 refs. (Presented at the American Chemical Society Northwest Regional Meeting, Seattle, Wash., 1973.)*

Mental depression survey data and hydrogen sulfide pollution levels are used to suggest that the high incidence of mental depression in the western Washington area is due to pollution by hydrogen sulfide. Suicide rate data are also presented and correlate positively with H2S levels in the air. A low incident sunlight, acidic soil, and high rainfall in the Washington area appear to contribute to the high H2S levels since the sulfide is not removed from the air by photosynthetic soil bacteria. The data from Washington are extrapolated to other geographical areas with high suicide rates.

**41018** **APTIC NO. 61388**

Udai, G., H. Oda, and T. Nakajima

A PATHOHISTOLOGICAL STUDY OF MICE EXPOSED TO NO. *(NO bakuro mausu no byori soshiki gakuteki kenkyu). Text in Japanese. Taiki Osen Kenkyu (J. Japan. Soc. Air Pollution), 8(3):423, Oct. 1973. (Presented at the Japan. Society for Air Pollution, Annual Meeting, 14th, Fukushima, Japan, Nov. 6-8, 1973.)*

Mice were exposed to 12 ppm of nitric oxide for 5 hr and half of the experimental group were sacrificed immediately after exposure, and half were killed 24 hr later. Control mice showed no histological anomalies. The group sacrificed directly after exposure showed edema and dilation of the vessels in the submucosal tissue of the trachea. The group sacrificed 24 hr after exposure showed proliferation of the mucosal epithelium of the trachea, and changes in the bronchial epithelium. Congestion of the alveoli was found in the immediately sacrificed mice. Anomalies in the heart, nervous system, cell metabolism, and other organs were noted in the group sacrificed after 24 hr. Exposure to NO is first evidenced in the respiratory system and progresses to the brain and heart which are damaged by oxygen deficiency.

**41019** **APTIC NO. 63409**

Yoshida, Katsumi

HEALTH IMPAIRED KOGAI - KOGAI DISEASE. *Technocrat (Japan), 7(3): 65-69, March 1973.*

A review is presented of Japan s experiences with environmental disease, known as Kogai disease. The most prevalent Kogai diseases are those caused by air pollution, the first among them being Yokkaichi Asthma in Yokkaichi. Since then, a number of investigations and research projects in various districts have revealed that the occurrence of such chronic lung diseases as bronchial asthma, asthmatic bronchitis, chronic bronchitis, and emphysema is overwhelmingly high in air-polluted areas. Another air pollution-caused affliction is Itai-itai disease which is caused by cadmium. A graph is presented illustrating the relationship between the number of inhabitants displaying the symptoms of chronic bronchitis and sulfur dioxide density. Air quality concentration goals are listed for sulfur dioxide, nitrogen dioxide, photochemical oxidants, and carbon monoxide.

**41020** **APTIC NO. 64672**

Yoshida, Ryo and Akiko Kosaku

A REPORT ON THE INVESTIGATION OF RESPIRATORY DISEASES MORBIDITY IN ICHIHARA AND SAKURA CITIES. *(Ichihara-shi, Sakura-shi ni okeru kokyuki shojo yushoritsu chosa hokoku). Text in Japanese. In: Investigation of Air and Water Pollution on Human Health. Chiba Prefectural Government (Japan), Dept. of Hygiene, p. 67-90, May 1973.*

Respiratory disease morbidity among women over 30 yrs of age and men over 60 yrs of age was investigated using the British Medical Research Council method in Ichihara and Sakura. The selection of subject area and people are questionable, since Ichihara is a rural community while Sakura is an urban community and the investigation is carried out on a compulsory basis in the former and a voluntary basis in the latter. The questionnaire reply rates for women and men were 76.7% and 80.8% in Ichihara and 81.7% and 70.1% in Sakura, respectively. The respiratory disease morbidity by sex and age showed very little difference between the two cities. In the case of women, incidents of cough in winter mornings, sputum in winter days and nights, blood tinged sputum, pursiness, and wheezes were higher in Ichihara, while incidents of wheeze associated with attack and asthmatic attack were higher in Sakura. In the case of men, incidents of cough, sputum, and pursiness affected by weather and history of pneumonia were higher in Ichihara city. The morbidities of chronic bronchitis for women and men was 1.5% and 9.3% in Ichihara and 1.4% and 5.3% in Sakura, respectively. The data on women in their forties were compared with that in other cities, and the morbidity in both cities tended to be lower.

**41021** **APTIC NO. 64761**

Yoshida, R., M. Adachi, and A. Kosaku

RESULTS OF THE INVESTIGATION ON THE MORBIDITY OF RESPIRATORY SYMPTOMS IN THE INHABITANTS OF FUJI CITY. *(Fjui-shi ni okeru kokyuki shojo yushoritsu chosa). Text in Japanese. Chiba Daigaku Kankyo Kagaku Kenkyu Hokoku (Rep. Environ. Res. Org. Chiba Univ.), (1):1-14, July 1973. 8 refs.*

Six hundred residents of Fuji were studied by questionnaire to determine the effect of air pollution on the morbidity of respiratory diseases. The sulfur dioxide concentration in the city is greater than the national standard. The results were compared with those for Kawaski, Tokyo, Yokohama. The morbidity of respiratory symptoms was the same or a little higher than in Kawasaki and generally higher than in Tokyo or Yokohama. The morbidity of chronic bronchitis in Fuji was

**41022** **APTIC NO. 60625**

INDIVIDUAL COMPONENTS OF AIR POLLUTION. *(Die einzelnen Komponenten der Luftverunreinigung). Text in German. Bull. Eidgenoess. Gesundheitsamtes, Beilage B, no. 6:324-343, Dec. 1973.*

The individual components of air pollution, such as sulfur dioxide, particulate matter, 3,4-benzo(a)pyrene, lead, fluorine compounds, carbon monoxide, and smog, as well as their effects on the human and organisms and on plants are described. The increase of the total SO2 emission between 1960 and 1970 were relatively moderate despite the strong increase in the fuel consumption, while an increase by about 40% until 1980 is expected unless adequate measures such as (fuel and flue gas desulfurization) are introduced. Domestic heating-generated SO2 is especially remarkable due to the low chimneys. Particulate matter, especially respirable dust and soot, are hazardous because they can penetrate to the lower respiratory tract, and may contain other pollutants, such as SO2. Benzo(a)pyrene concentrations of 2-15 micrograms/1000 cu m were measured in Basel and Zurich. Carbon monoxide, emitted mostly by automobiles, causes no subjective symptoms of poisoning as long as its concentration is below 60 cu cm/cu m, corresponding to COHb values below 10%. The rate of resorption of atmospheric lead is estimated at 30-40%. The lead concentration in Zurich increased from 1.5 microgram/cu m in 1949 to 1.9 micrograms/cu m in 1973. Photochemical smog and fluorine compounds have strong irritative effect on the human organism and on plants.

**41023** **APTIC NO. 60793**

World Health Organization, International Agency for Research on Cancer Working Group on the Evaluation of the Carcinogenic Risk of Chemicals to Man

DIBENZO(A,I)PYRENE. *In: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man: Certain Polycyclic Aromatic Hydrocarbons and Heterocyclic Compounds. Vol. 3, 1973, p. 215-223. 33 refs.*

The chemical and physical properties of dibenzo(a,i)pyrene (C24H14) are reviewed including synonyms, chemical formula, molecular weight, description, melting point, absorption spectroscopy, solubility and/or volatility, and chemical reactivity. Analytical methods include paper, thin-layer, and gas chromatography, fluorescence spectroscopy, low-temperature spectroscopy, and electrophoretic separation. The DB(a,i)P has been found in automobile exhaust gas, cigarette smoke, and coal tar. Studies on carcinogenicity in animals are described. Subcutaneous injections of DB(a,i)P resulted in the rapid appearance of local sarcomas in the hamster and the mouse. The smallest single dose which produced sarcomas in mice was 50 micrograms. Repeated skin application in mice was also effective, but DB(a,i)P was less active than benzo(a)pyrene. No case reports or epidemiological studies on the significance of DB(a,i)P exposure to man are available. However, coal tar and other materials which are known to be carcinogenic to man may contain DB(a,i)P. The substance has also been detected in other environmental situations.

**41024** **APTIC NO. 63340**

Saitama Prefectural Government (Japan), Dept. of Public Health

REPORT ON THE HEALTH INVESTIGATION IN THE NAMPEI DISTRICT, KAWAGUCHI CITY, IN FEBRUARY 1973. *(Kenko chosa kekka hokokusho, Kawaguchi-shi Nanpei chiku). Text in Japanese. 50p., Feb. 1973. 31 refs.*

An epidemiological study of health and environmental pollution was made in a polluted area of Kawaguchi city. Women over 30 years and men over 60 years old, who had resided in Kawaguchi for more than 5 yr and who have not been affected by occupational diseases, were selected at random. The same conditions were applied to the selection of subjects from a control area, Tokorozawa city; 199 men and 400 women from Kawaguchi, and 200 men and 399 women were examined. Respiratory diseases were investigated through interviews by nurses and physicians, and clinical studies were made on sputum, respiratory functions, urinalysis, chest X-rays, and on general health. The levels of sulfur oxide and suspended particulate concentrations were studied. For women between 30 and 59, 10.2% of the Kawaguchi women and 4.5% of the Tokorozawa women had continuous coughs, and 16.7% of the Kawaguchi women and 9% of the Tokorozawa women had continuous sputum. The total ratio in all examinees for continuous coughs and sputums were 7.5% in Kawaguchi and 2.8% in Tokorozawa, and the morbidity difference was not significant. Obstructive respiratory impairment, which usually has a direct connection with air pollution, was 7.5% in the control area and 1% in the polluted area. The SOx level at the 12 monitoring locations of Kawaguchi by the lead dioxide method in 1972 was 0.95 mg/100 sq cm/day. The hourly total average electroconductivity was 0.032 ppm. The Tokorozawa average by lead dioxide was 0.33 mg/100 sq cm/day, and by electroconductivity, 0.022 ppm/hr. Suspended particulate averages taken from the 11 locations of Kawaguchi was 0.57 mg/cu m, with the maximum hourly count of 0.99 mg/cu m. The average of Tokorozawa was 0.35 mg with 0.49 mg maximum hourly count. The total prefectural average of Saitama was 0.06 mg.

**41025** **APTIC NO. 64550**

Environmental Protection Agency, Washington, D. C.

EPA S POSITION ON THE HEALTH IMPLICATIONS OF AIRBORNE LEAD. *Preprint, 121p., Nov. 28, 1973. 190 refs.*

The Environmental Protection Agency has set forth controversial standards for the use of lead and phosphorus additives in gasoline. Evidence on the toxic effects of lead and lead additives is reviewed to provide a basis for a decision on the need for strict standards. The occurrence and sources of lead in the environment, health aspects of lead exposure, lead body burdens, the relationship of environmental lead exposure to human lead intake, lead exposure from dust fall, and the extend of lead exposure among the general population are reviewed and discussed. A small but significant fraction of the adult population has blood lead levels of 40 micrograms/100 or higher, and such levels occur in a much larger proportion of urban children. Such levels are medically undesirable and should be reduced if possible. Sources of exposure include food, water, air, and ingested nonfood items such as lead-based paint and dust. Food is the largest contributor of lead to the general population. Lead-based paint is the major cause of overt lead poisoning in children, although other sources play an important role in childhood exposure. Lead in dust and dirt contributes to increased lead levels in man, both through inhalation of resuspended dusts and, at least in children, through inadvertent ingestion of dirt and dust. This source could give enough lead to produce poisoning in a child exposed to otheer sources. Automotive lead is a major contributor to lead in dust and dirt and has been related to undue lead absorption in children. Reductions in the lead content of paint, food, water, and insecticides have been made. Lead in gasoline is the most important remaining source of controllable lead entering the environment. Reduction of lead in gasoline will result in reduced exposure of man, both directly from reduction in atmospheric lead and indirectly from reduction of lead in dirt, dust, and at least to a minor extent, on and in foods. (Author conclusions modified)

**41026** **APTIC NO. 64759**

Saitama Prefecture (Japan), Bureau of Public Health

REPORT OF HEALTH INVESTIGATION ON THE INHABITANTS IN SHIMONAKAJO AND SUKA AREAS IN GYODA CITY. *(Gyoda-shi Shmonakajo Suka chiku kenko chosa kekka hokokusho). Text in Japanese. 62p., March 1973.*

Following the petition of inhabitants in the Shimonakajo area in Gyoda to the Governor of Saitama Prefecture concerning, an investigation was begun of the causes of frequent occurrence of asthma, bronchitis, and liver diseases possibly attributable to environmental pollution, dated April 28, 1972, and investigation of respiratory diseas such as bronchial asthma, chronic bronchitis, and pulmonary emphysema, as well as hepatitis, was made on the inhabitants of Shimonakajo area compared to those of inhabitants in a seemingly unpolluted area, Suka in the same city. Even after investigating the status by BMRC questionnaires and examination of the respiratory function of sputum, of chest X-rays, of blood and urine, and of sulfur dioxide concentrations, there was no significant difference of the morbidity of such respiratory diseases between the two areas. It was difficult to diagnose or accurately find the cause of hepatitis; however, because of the negativity of detecting the Australian antigen, the epidemically prevailing hepatitis in 1969 and 1970 could have been caused by A type virus. Because of the sporadic occurrence of hepatitis at those times, it would be reasonable to presume that the mode of spreading the viral hepatitis was stool-to-mouth.

**41027** **APTIC NO. 64773**

Tokyo Bureau of Public Health (Japan), Dept. of Medicine and Welfare

REPORT ON THE STATUS OF CASUALTIES DUE TO PHOTOCHEMICAL SMOG, 1973. *(Showa 48 nendo kokagaku sumoggu higai todokede jokyo). Text in Japanese. 7p., Nov. 1973.*

The total number of notification of casualties due to photochemical smog from April through Oct. 1973 comprised 4035 persons with one hospitalized, including 1001 primary-schoolchildren, 1126 middle-school pupils, 126 high-school boys and girls, and 1782 others. The total monthly number of persons was 403 in April, 695 in May, 387 in June, 1869 in July, 680 in Aug., 1 in Sept., and zero in Oct. Locally, the number of persons was 2895 in center city, 694 in the western part, 426 in the eastern part and 20 in the Tama-southern part. The highest number of persons in one notification/day was 736 on July 6. The number of injured persons was 3106 when the oxidant concentration was more than 0.15 ppm, 568 at 0.11-0.14 ppm, and 236 at 0.07-0.10 ppm. The number of notifications was highest between 10 am and noon with 1722 persons injured, followed by between noon and 2 pm with 1323 persons, then by between 2 and 4 pm with 637 persons. There were 8 days without any notifications even with a photochemical smog warning, and 13 days with notifications without any warning, and 22 persons were injured.

**41028** **APTIC NO. 64774**

Yokohama Municipal Univ. (Japan), School of Medicine

ACTUAL CONDITIONS OF PHOTOCHEMICAL AIR POLLUTION DAMAGE ON JUNE 10 AND 11, 1972. *(Showa 47 nen 6 gatsu 10, 11 nichi no kokagaku taiki osen ni yoru higai ni jittai). Text in Japanese. Kanagawa-ken Taiki Osen Chosa Kenkyu Hokoku (Tech. Rept. Air Pollution Yokohama-Kawasaka Ind. Area), no. 15:168-181, Feb. 1973. 2 refs.*

An investigation on the actual damages due to photochemical air pollution among schoolchildren who complained of various symptoms caused by the air pollution episode which occurred on June 10 and 11 was conducted. Of those who answered the questionnaire, 64.8% manifested the symptoms at 2:00 pm, on the 10th, while 62.4% complained between 1 and 2:00 pm on the 11th. More than 90% had exercised before the symptoms appeared. General symptoms consisted of fatigue, headache, dimmed consciousness, numbness of the limbs, fever, and convulsions. The symptoms observed were prolonged among 50% of the children affected 10th for two hr, and they were prolonged for 2 hr among 80.1% of the others. Ninety-seven percent of the high school students in the Isogo Technical High School complained of ophthalmological symptoms. Respiratory systems occurred in 90% of the schoolchildren except those attending Isogo Technical High School.

## 1972

**41029** **APTIC NO. 63063**

Beck, E. G., P. F. Holt, and N. Manojlovic

COMPARISON OF EFFECTS ON MACROPHAGE CULTURES OF GLASS FIBRE, GLASS POWDER, AND CHYRSOTILE ASBESTOS. *Brit. J. Ind. Med. (London), vol. 29:280-286, 1972. 9 refs.*

The effects of glass fiber, glass powder, and chyrsotile asbestos on macrophage cultures were studied on guinea pig alveolar and peritoneal macrophages. Control experiments were run with quartz, corundum, and no dust. Glass fiber behaved like chyrsotile in producing an increase in cell membrane permeability. This was demonstrable by the increase in lactic dehydrogenase activity in the supernatant fluid. The metabolism, measured by lactate production, was not reduced as it was when quartz was phagocytosed. Glass powder behaved like the inert dust corundum, producing little change in the number of cells stained by erythrosin B and a small increase in lactate dehydrogenase activity, both being in the range of the control. There was an increase in lactate production as a result of higher metabolism due to phagocytosis. Dusts produced two basic effects, a toxic effect and a change in cell membrane permeability. A nonspecific effect on the cell membrane due to the slow and sometimes incomplete process of ingestion of long fibers was probably a function of the morphology, particularly the length of the fibers. A primary specific effect induced by some dusts immediately followed contact with the cell membrane. (Author abstract modified)

**41030** **APTIC NO. 63034**

Blum, Harold F.

ULTRAVIOLET RADIATION OF SUNLIGHT AND SKIN CANCER. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 373-378. 10 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

The effects of increased ultraviolet (UV) radiation in sunlight, resulting from decreased ozone cover, on the incidence of skin cancer in man is discussed. Erythema is not closely enough related to cancer growth to serve as an index. Only recently have UV irradiance and skin cancer incidence been studied simultaneously in the same geographical area. Laboratory experiments indicate that only wavelengths between about 0.29 micron and 0.32 micron normally cause cancer, but that large doses at longer wavelengths may also be effective. Cumulative effects of successive doses result in accelerated cancer growth. The physiological effects of reducing the O3 cover are very difficult to estimate, and education in the matter of exposure could mitigate them considerably. (Author abstract modified)

**41031** **APTIC NO. 63036**

Caldwell, Martyn M.

ECOLOGIC CONSIDERATIONS OF SOLAR RADIATION CHANGE. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 386-393. 23 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

The biological implications of increased solar ultraviolet (UV) radiation on the earth's surface, which results from decreased stratospheric ozone concentrations are discussed. The UV wavelengths which are most influenced by changes in O3 concentration are also those most effectively absorbed by nucleic acids and proteins. Since most UV caused physiological alterations are deleterious, many organisms developed avoidance mechanisms to minimize UV exposure. A complete evaluation of the biological impact of increased UV radiation must take into account subtle changes in genetic and physiological properties of all organisms, including those which may appear to have little immediate economic value. (Author abstract modified)

**41032** **APTIC NO. 62908**

Cotes, J. E. and G. B. Field

LUNG GAS EXCHANGE IN SIMPLE PNEUMOCONIOSIS OF COAL WORKERS. *Brit. J. Ind. Med. (London), vol. 29:268-273, 1972. 27 refs.*

Indices of lung function and gas exchange, including some based on measurement of the arterial blood gases and physiological response to exercise were obtained on 19 coal workers with simple pneumoconiosis of the pinhead of micronodular type, of whom 11 also had bronchitis. P-type pneumoconiosis differed from the m-type in being associated with a smaller transfer factor, larger physiological deadspace relative to tidal volume (Vd/VT), and increased ventilation during submaximal exercise. The Vd/Vt was also raised in patients with bronchitis. The venous admixture effect (including physiological shunt) was within normal limits. Breathing oxygen increased Vd/Vt in patients with bronchitis but not with p-type pneumoconiosis. The findings are evidence for p-type pneumoconiosis being associated with abnormal function of the lung parenchyma; the changes are consistent with cystic lung. (Author abstract)

**41033** **APTIC NO. 64600**

DeLucia, Anthony J., Paul M. Hoque, Mohammad G. Mustafa, and Carroll E. Cross

OZONE INTERACTION WITH RODENT LUNG: EFFECT ON SULFHYDRYLS AND SULFHYDRYL-CONTAINING ENZYME ACTIVITIES. *J. Lab. and Clin. Med., 80(4):559-566, Oct. 1972. 22 refs.*

The effects of acute and chronic exposures of rodents to ozone on levels of sulfhydryls (SH) and SH-containing enzymes in lung tissue were investigated. Rats were exposed in vivo to O3 at acute levels of 2 ppm for 4-8 hr and chronically for 0.8 ppm for 10 days. In vitro exposures were 2-3 ppm O3 for 30 min. Lung SH levels decreased 18% for protein fraction (PSH) and 41% for nonprotein fraction (NPSH) after acute in vivo exposure. There was a 20% loss for PSH and 95% for NPSH after in vitro exposure. The loss of lung SH is an important consequence of acute O3 stress. Acute in vivo exposure cause at 15-30% depression in activities of several enzymes containing SH at the function sites. Lung SH was maintained at normal levels under chronic O3 exposure indicating that lungs of the chronically exposed animals acquired a metabolic adaptation. (Author abstract modified)

**41034** **APTIC NO. 62911**

Egle, John L., Jr.

EFFECTS OF INHALED ACETALDEHYDE AND PROPIONALDEHYDE ON BLOOD PRESSURE AND HEART RATE. *Toxicol. Appl. Pharmacol., vol. 23: 131-135, 1972. 15 refs.*

The effects of inhaled acetaldehyde and propionaldehyde on blood pressure and heart rate were studied. The objectives were to determine if effects were caused by concentrations likely to occur in cigarette smoke and if not, to determine the concentrations required to affect blood pressure and heart rate. Anesthetized rats inhaled varying concentrations of acetaldehyde (0.5-30 micrograms/ml) and propionaldehyde (3.0-200 micrograms/ml) for 1 min intervals while changes in arterial blood pressure and heart rate were measured. With acetaldehyde, significant increases occurred to blood pressure at concentrations of 3.0 micrograms/ml and above. Concentrations of 12 and 25 micrograms/ml significantly increased heart rate. Similar effects were seen with slightly higher concentrations of propionaldehyde. Concentrations of acetaldehyde and propionaldehyde producing significant changes in blood pressure and heart rate were somewhat higher than those encountered in cigarette smoking. (Author abstract modified)

**41035** **APTIC NO. 63235**

Giacomelli-Maltoni, Giuseppina, Carlo Melandri, Vittorio Prodi, and Giuseppe Tarroni

DEPOSITION EFFICIENCY OF MONODISPERSE PARTICLES IN HUMAN RESPIRATORY TRACT. *Am. Ind. Hyg. Assoc. J., 33(9):603-610, Sept. 1972. 9 refs.*

Experimental data are reported on total deposition of a solid monodisperse aerosol along the human respiratory tract in a study with 25 healthy adults of both sexes. The test aerosol was generated by condensation of carnauba wax vapor onto suitable condensation nuclei. The particles were solid spheres at body temperature and ranged from 0.2 to 2 micron diameter, with a geometric standard deviation of less than 1.1. The deposition efficiency was assessed by photometric measurement of light scattering at 90 deg in the inhaled and exhaled air. On each exposure subject the relevant spirometric parameters were assessed in order to correlate these with the deposition data. Measurements were made at constant respiratory frequency and tidal volume, and at spontaneous respiration conditions. In the lower part of the size range considered (below 0.5 micron), practically all the particles deposit in the pulmonary region. Therefore, these deposition data can also be accepted as deposition efficiency in the alveoli, which is a critical region as far as inhalation toxicology is concerned.

**41036** **APTIC NO. 62906**

Governa, M. and C. Rosanda

A HISTOCHEMICAL STUDY OF THE ASBESTOS BODY COATING. *Brit. J. Ind. Med. (London), vol. 29:154-159, 1972. 16 refs.*

Specimens of lung from seven human cases of asbestosis were studied. After iron extraction, asbestos bodies were tested by histochemical methods for mucopolysaccharides. The results of the reactions suggest that acid mucopolysaccharides are present in the coating of most asbestos bodies. During the formation of the bodies, acid mucopolysaccharides might act as a matrix for iron deposition on the coating. Thus, these intercellular components may play a key role in asbestos body formation. (Author abstract modified)

**41037** **APTIC NO. 62910**

Jones, B. M., J. H. Edwards, and J. C. Wagner

ABSORPTION OF SERUM PROTEINS BY INORGANIC DUSTS. *Brit. J. Ind. Med. (London), vol. 29:287-292, 1972. 12 refs.*

Four samples of coal dust of different ranks, five types of asbestos, and a sample of silica were each incubated with normal serum and with immunoglobulin-G (IgG). Then the amount of protein absorbed onto the particle surfaces was estimated. The total amount of protein absorbed by the coal samples was not related to the rank of coal, and surface absorption by the dusts did not detectably alter protein to a form capable of reacting with rheumatoid factor; the latter finding was in disagreement with the hypothesis put forward by Payne to explain the presence of rheumatoid factor in the serum of a large proportion of coal workers with pneumoconiosis. Estimation of immunoglobulin levels after incubation of normal serum with 10 samples of coal suggested that IgG might be selectively absorbed, and rheumatoid factor was absorbed in preference to normal serum proteins by dust samples which had not been coated with normal serum. (Author abstract)

**41038** **APTIC NO. 62904**

Lily, R. E. C., P. V. Cole, and L. H. Hawkins

SPECTROPHOTOMETRIC MEASUREMENT OF CARBOXYHAEMOGLOBIN. AN EVALUATION OF THE METHOD OF COMMINS AND LAWTHER. *Brit. J. Ind. Med. (London), vol. 29:454-457, 1972. 10 refs.*

The spectrophotometric method of Commins and Lawther for the measurement of carboxyhemoglobin (COHb) concentration was evaluated for both accuracy and sensitivity. The method was calibrated by equilibrating diluted blood samples with known concentrations of carbon monoxide in the air and by measuring the resultant COHb saturations. Over the range 0-40% COHb saturation, the mean error was 0.67% COHb (standard deviation 0.65). The accuracy of the method was more than sufficient for measurement of both the high COHb levels found in clinical situations and the lower COHb saturation resulting from exposure to urban air and cigarette smoking. (Author abstract)

**41039** **APTIC NO. 63275**

Ohyashiki, Masachi

AN EXPERIMENTAL STUDY ON THE EFFECTS OF NITROGEN OXIDES OF LOW CONCENTRATION. *(Teinodo nisankachisso no seitai ni oyobosu eikyo ni kansura jikken teki kento). Text in Japanese. Yokohama Igaku (Yokohama Med. J.), 23(6):387-403, Dec. 1972. 32 refs.*

The effects of low concentrations of nitrogen dioxide on animals were studied. The body weight and blood findings were studied in two groups of guinea pigs exposed repeatedly to 1 and 5 ppm NO2; a significant increase of hemoglobin was noted in the 5 ppm group. The body weight, blood findings, and histological changes in several parenchymatous organs were studied in rabbits exposed repeatedly to 2-3 ppm NO2; no specific changes were observed. Although the pulse rate of rabbits revealed no specific changes in the experimental group, two out of four rabbits had irregularity in pulsation rhythm upon inhalation of 3 and 10 ppm NO2. Also, one of the other rabbits without such a reaction developed a similar irregularity upon inhaling 30 ppm. This phenomenon was observed only strictly after inhalation of NO2, and there was no specific pattern in the occurrence of such irregularity. The control group of rabbits showed a tendency of a decrease in pulse rate due to inhalation of NO2. However, no irregularity of pulsation rhythm appeared upon inhalation of NO2 throughout concentrations of 3, 10, and 30 ppm. The function of the automatic nervous system by pharmacological tests showed positive reactions against adrenalin or acetylcholine on all of the experimental group, while only one in the control group indicated a similar reaction against acetylcholine.

**41040** **APTIC NO. 62981**

Saffiotti, Umberto, Ruggero Montesano, Arthur R. Sellakumar, Francesco Cefis, and David G. Kaufman

RESPIRATORY TRACT CARCINOGENESIS IN HAMSTERS INDUCED BY DIFFERENT NUMBERS OF ADMINISTRATIONS OF BENZO(A)PYRENE AND FERRIC OXIDE. *Cancer Res., vol. 32:1073-1081, May 1972. 10 refs.*

Benzo(a)pyrene, prepared as a suspension of fine crystalline particles attached to particles of ferric oxide in 0.9% sodium chloride solution, was administered by intratracheal instillation to Syrian golden hamsters. A single administration of 37.5 mg benzo(a)pyrene with 12.5 mg ferric oxide in 0.5 ml 0.9% NaCl solution induced five bronchogenic carcinomas and five histologically benign respiratory tumors in a total of 61 hamsters. A single administration of 5 mg benzo(a)pyrene with 45 mg ferric oxide in 0.5 ml 0.9% NaCl solution induced one peripheral adenocarcinoma and six histologically benign respiratory tumors in a total of 189 hamsters. Repeated instillations, each of 3 mg benzo(a)pyrene with 3 mg ferric oxide in 0.2 ml 0.9% NaCl solution, were administered 5, 10, or 15 times; two experimental groups were used at each dose level. Respiratory tract tumors, mostly bronchogenic carcinomas, were induced in all groups, and a positive dose-response relationship was demonstrated. (Author summary)

**41041** **APTIC NO. 63248**

Schmaehl, D.

CARCINOGENIC FACTORS IN THE ENVIRONMENT. *(Cancerogene Faktoren in der Umwelt). Text in German. Ver. Deut. Ges. Inn. Med., vol. 28:25-34, 1972. 29 refs.*

Studies and observations on environmental carcinogens, such as aresenic, aflatoxins, nitrosamines, certain drugs, and 3,4-benzo(a)pyrene are reviewed. Aromatic polycyclic hydrocarbons, such as 3,4-benzo(a)pyrene, are generated in combustion processes in industrial and domestic heating, as well as in internal combustion engines. The 3,4-benzo(a)pyrene concentrations in urban air may amount to 400 micrograms/1000 cu m. The 3,4-benzo(a)pyrene present in the air settles on plants and in the soil from which it is taken up by plants. Increased tumor mortality in workers exposed to high 3,4-benzo(a)pyrene concentrations was observed. Epithelial carcinoma was found in about 40% of experimental mice after skin application of a total 3,4-benzo(a)pyrene dose of 300 micrograms over a period of 75 weeks.

**41042** **APTIC NO. 63033**

Sheldon, Donald R.

STATUS OF THE CIAP BIOLOGICAL IMPACT PROJECT. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 369-372. 2 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

The scope of the Climatic Impact Assessment Program, Biological Impact Project is summarized and recommendations which grew out of the Biological Impact Workshop of Sept. 1972 are presented. There are three main areas of interest: the effects of enhanced ultraviolet radiance on skin cancer and human health, on terrestrial plants, on the aquatic biome, and on insect populations; agricultural response to climatic change; and measurements and systems evaluation. The recommendations center on further studies in those areas.

**41043** **APTIC NO. 62946**

Stewart, Richard D., Paul E. Newton, Michael J. Hosko, and Jack E. Peterson

THE EFFECT OF CARBON MONOXIDE ON TIME PERCEPTION. *Medical Coll. Wisconsin, Milwaukee, Dept. of Environmental Medicine, Environmental Protection Agency/Coordinating Research Council Contract CRC-APRAC, Proj. CAPM-3-68, Rept. CRC APRAC CAPM-3-68 MCOW-ENVM-CO-72-2, 61p., 1972. 16 refs.*

NTIS: PB 214651

Twenty-seven healthy, adult male and female volunteers were exposed to carbon monoxide concentrations of 2, 50, 100, 200, and 500 ppm for periods up to 4.5 hr to determine the effect of the gas upon time perception. These exposures, which resulted in a range of carboxyhemoglobin saturations up to 20%, produced no impairment in the ability of the subjects to perform the Beard-Wertheim Time Discrimination Test, to estimate 10 or 30 sec intervals, or to perform the Marquette Time Estimation Test. Test data is presented in tables. (Author abstract modified)

**41044** **APTIC NO. 62905**

Harries, P. G., F. A. F. Mackenzie, G. Sheers, J. H. Kemp, T. P. Oliver, and D. S. Wright

RADIOLOGICAL SURVEY OF MEN EXPOSED TO ASBESTOS IN NAVAL DOCKYARDS. *Brit. J. Ind. Med. (London), vol. 29:274-279, 1972. 12 refs.*

Asbestos related abnormalities were found in 3% of a 10% sample population in radiological surveys of the naval dockyards at Portsmouth, Chatham, and Rosyth. The prevalence of these abnormalities was related to the type of occupation and duration of exposure to asbestos. The results confirmed the findings of an earlier survey at the Devonport dockyard. No association between smoking and the incidence of parenchymal or pleural disease due to asbestos was detected. Pleural abnormalities were 10 times more frequent than parenchymal disease, and concern was felt over the uncertainty of the prognosis in men with pleural abnormalities, especially since 37 men developed pleural mesothelioma in Devonport since 1965. More work is required to establish the true significance of pleural abnormalities caused by asbestos and to explore possible methods of treatment. (Author abstract)

**41045** **APTIC NO. 62986**

Dept. of Health, Education, and Welfare, Washington, D. C., National Inst. for Occupational Safety and Health

CRITERIA FOR A RECOMMENDED STANDARD.... OCCUPATIONAL EXPOSURE TO INORGANIC LEAD (FINAL REPORT). *Rept. HSM 73-11010, 105p., 1972. 87 refs.*

A National Institute for Occupational Safety and Health criteria document is presented for occupational exposure to inorganic lead. Topics include: recommendations for an inorganic lead standard, biologic effects of exposure, environmental data, and development of the standard. A method for sampling lead in air is presented in one of the appendices. Occupational exposure to inorganic lead is suggested to be such that workers will not be exposed to the inorganic form at a concentration greater than 0.15 mg Pb/cu m, determined as a time-weighted average exposure for an 8-hr workday. Requirements for respirator usage at concentrations above the standard are listed for inorganic lead dust and inorganic lead fume.

**41046** **APTIC NO. 63047**

National Inst. for Occupational Safety and Health, Washington, D. C., Office of Research and Standards Development

CRITERIA FOR A RECOMMENDED STANDARD .... OCCUPATIONAL EXPOSURE TO BERYLLIUM (FINAL REPORT). *Rept. HSM 72-10268, 127p., 1972. 117 refs.*

A National Institute for Occupational Safety and Health criteria document is presented for occupational exposure to beryllium. Topics include: recommendations for a beryllium standard, properties and sources, biologic effects of exposure, environmental data, development of the standard, and compaibility with emission standards. Sampling and analytical practices are given in the appendices. Occupational exposure to beryllium is suggested to be such that no worker shall be exposed to a concentration of beryllium more than 2 micrograms of total airborne particulate beryllium per cu m of air as determined by the breathing zone and general air methods for a time-weighted average exposure over an 8-hr work day. No peak concentration shall exceed 25 micrograms of beryllium per cu m as determined by a minimum sampling time of 30 min.

## 1971

**41047** **APTIC NO. 64549**

Berton, Alain

AIR POLLUTION AND THE PRINCIPAL CHEMICAL HAZARDS IN INDUSTRIAL PLANTS IN THE PARIS

*REGION. (La pollution atmospherique et les principaux risques chimiques dans les usines de la region parisienne). Text in French. Apave, 52(175):67-69, 1971. 2 refs.*

Air pollution and the principal chemical hazards in industrial plants in the Paris region are surveyed on the basis of occupational diseases statistics for the last 30 years. The incidence of occupational diseases due to lead and benzene poisoning has decreased considerably; there is practically no change in the incidence of such occupational diseases and cement dust-induced dermatitis, silicosis, and anomalies produced by ethylene-derived chlorinated solvents. Carbon monoxide as a pollutant causes problems especially in underground garages and car repair shops, while nitrogen oxides pollute the air in metal surface treatment plants. Hydrocyanic acid vapors in electroplating shops can be abated by improved ventilation. Chromic acid vapors generated in such workplaces can perforate the nasal septum and may be carcinogenic. Beryllium, methanol, ketones, aldehydes, phenols, and mercury are among the air pollutants which commonly cause industrial occupational disease. Beryllium poisoning during machine operations can be prevented by conducting the operations in closed space by manipulators.

**41048** **APTIC NO. 60733**

Frappa, Jean

THE ACTION OF MICROQUANTITIES OF AIR POLLUTANTS ON CULTURED MAMMAL BUCCAL CELLS. *(Action des micro-constituants atmospheriques sur des cellules buccales de mammiferes mise en culture). Text in French. Claude-Bernard Univ., Lyon (France), Microbiology Dept., Thesis (Ph.D.), Lyon, June 29, 1971, 169p. 117 refs.*

The effects of an organomineral dust complex, collected from the air by means of a high-volume sampler, and of its mineral (99%) and organic (1%) fractions on the growth and respiration of calf embryonal buccal cells cultured in a semisynthetic substrate containing lactalbumin and 10% calf serum were studied. The organic fraction contained polycyclic aromatic hydrocarbons such as 3,4-benzo(a)pyrene, 1,2-benzo(a)anthracene, benzo(g,h,i)perylene, and coronene. Tardive, but considerable growth inhibitory effect of high concentrations (up to 1000 gamma/ml) of the organomineral complex, similar inhibitory action of the organic fraction, and absence of inhibitory action of the mineral fraction were determined in the buccal cell cultures. The organomineral complex had depressive effect on the cellular respiration during the first hour of cultivation. The organic fraction also reduced the cellular oxygen consumption, while the mineral fraction increased the respiration activity. Cells that survived 48 hr showed resistance to the toxic agents. The effects on the cell growth and respiration of synthetic 3,4-benzo(a)pyrene, 1,2-benzo(a)anthracene, benzo(g,h,i)perylene and coronene were similar to those produced by the organic fraction of the atmospheric dust.

**41049** **APTIC NO. 64542**

Whin, C.

AIR POLLUTION CAUSED BY AUTOMOBILES. THE GOVERNMENT GIVES THIS PROBLEM PARTICULAR ATTENTION. *(La pollution de l atmosphere par les vehicules automobiles. Le gouvernement a decide d examiner ce probleme avec une attention particuliere). Text in French. Auto-Volt, no. 430:75-77, Sept. 1971.*

The effects of the major exhaust emission components on the human organism are surveyed, and proposed maximum allowable concentrations of carbon monoxide and nitrogen oxides in the air are presented. Carbon monoxide affects the central nervous system and the cardiovascular system. Intense but transitory respiratory troubles are caused by 5 ppm nitrogen dioxide inhaled for 10 min. It is yet possible to ascertain the toxicological significance of automotive exhaust lead. Peroxyacetyl nitrate causes modifications of respiration and physical performance when inhaled in concentrations as low as 0.3-0.5 ppm. The maximum allowable hourly CO concentration as proposed should be 40 ppm, and the 8-hour value should be set at 15 ppm. The 1-hour concentration standard proposed for nitrogen oxides is 0.25 ppm.

**41050** **APTIC NO. 64723**

Kitakyushu Municipal Office (Japan), Bureau of Environmental Protection

REPORT OF EPIDEMIOLOGICAL INVESTIGATION CONCERNING AIR POLLUTION, 1970. - RELATION BETWEEN ASTHMATOID DISEASES OF SCHOOLCHILDREN AND AIR POLLUTION IN KITAKYUSHU CITY. *(Showa 45 nendo Taiki osen ni kansuru ekigaku chosa hokokusho: Kitaykushu-shi ni okeru gakudo no zensoku yo shikkan to taiki osen tono kankei). Text in Japanese. 72p., Nov. 1971.*

An epidemiological survey of 18850 schoolchildren in Kitakyushu revealed serious asthmatic cases, 883 typical slight asthmatic cases, and 1778 atypical asthmatic cases of primary-school children. There were 125 typical serious asthmatic cases, 233 typical slight asthmatic cases, and 344 atypical asthmatic cases for middle-school pupils. These atypical cases have increased in all the wards in the city since 1969. There was a clear correlation between dustfall and the morbidity of atypical asthma. The age of atypical asthmatoid disease onset was higher in more polluted areas. A correlation between bronchial asthma and house dust allergies was noted.

## 1970

**41051** **APTIC NO. 64606**

Bohlig, Heinz

HEALTH HAZARDS DUE TO ASBESTOS CEMENT. *(Gesundheitsgefaehrdung durch Asbestzement). Text in German. Zbl. Arbeitsmed., no. 7:201-209, 1970. 7 refs.*

Possible occupational and general health hazards due to the manufacture, processing, and use of asbestos cement and articles made of this material are discussed. The exposure to asbestos in the asbestos cement manufacturing process is highest during the mixing and milling operations, but the fiber concentrations in the air can be substantially reduced by high-efficiency exhaust systems. Asbestos fibers released during the finishing and trimming operations in the manufacturing plant can be effectively removed from the air, unlike asbestos fibers generated during the handling, final processing, and fitting of asbestos cement articles. Due to the considerable uncertainty in the data on workers and workplaces exposed to asbestos cement, and on the morbidity of related asbestosis and cancers, all that can be unequivocally stated is that the morbidity seems to be substantially lower among workers exposed to asbestos cement than among workers employed in other branches of the asbestos industry. The morbidity ratio for workers exposed to asbestos cement and asbestos in the asbestos textile industries ranges from 1:5 to 1:11. While the existence of public health hazards due to asbestos cement products is highly uncertain, the increased frequency of mesothelioma in subjects living near other asbestos processing plants is indicative of potential hazards.

**41052** **APTIC NO. 64522**

Burilkov, T. and L. Babadjov

ENDEMIC OCCURRENCE OF BILATERAL PLEURAL CALCIFICATIONS. *(Ein Beitrag zum endemischen Auftreten doppelseitiger Pleuraverkalkungen). Text in German. Praxis Pneumol., vol. 24:433-438, 1970. 18 refs.*

An X-ray examination revealed bilateral pleural calcifications in 11 of 3896 persons in the district of Kolarovo, a region where asbestos had never been produced or asbestos products been manufactured. Geological investigations, however, established the presence of circumscribed deposits of amphibole asbestos. The plaques were in the inhabitants living in four villages where asbestos deposits occurred and not in the inhabitants of the other four villages. The observations appear to confirm the view that the adverse effects of asbestos are not confined to inhalation of massive quantities of asbestos dust, as occurs during its production and manufacture, but may also arise from inhalation of small quantities which are released from asbestos-containing soil.

### 1968

**41053** **APTIC NO. 64608**

Ichioka, Masahiro, Hiromasa Kita, and Yutaka Yamaguchi

A MODEL EXPERIMENT ON THE AIRWAY VISCOUS MEMBRANE ABSORPTION RATE OF SO2 AND NO2. REPORT 2: THE EFFECT OF COEXISTING AEROSOLS. *(SO2 oyobi NO2 ni taisuru kido nenmaku no kyushu koritsu ni kansuru mokeiteki jikken ni tsuite (dainiho)--kyoson erozoru no eikyo). Text in Japanese. Nippon Eiseigaku Zasshi (Japan. J. Hyg.), 23(1):187. 1968. 2 refs.*

While sulfur dioxide is mostly absorbed into the viscous membrane of the upper airway, nitrogen dioxide reaches the deeper part of the respiratory apparatus. When accompanied by aerosol, SO2 can also reach the deeper part of airway, with the vector aerosols acting as carrier. To verify this conjecture, an experiment was conducted with a model airway of glass tubes (9 mm diameter and 100 mm long) lined by a filter paper and soaked by 0.5 ml liquid. This was considered as one segment. Six of these segments were connected together into a long tube, and the last tube was connected with a bubbler. A 2% sodium chloride solution was atomized and mixed with 100-150 ppm of SO2, making the final concentration about 4-10 ppm SO2. The mixture was passed through the tube at the rate of 3 l/min. The amounts of absorption of SO2 and the aerosol-SO2 mixture were measured. Most of the SO2 was captured in the first segment of the tube, and only traces of SO2 reached the bubbler. When SO2 was mixed with aerosol, a considerable amount of SO2 reached the bubbler, and the amounts captured in later segments were higher than with SO2 alone.

### 1964

**41054** **APTIC NO. 62979**

Salem, E. S., S. Permutt, R. L. Riley, and J. W. C. Johnson

EFFECT OF RESPIRATORY GASES ON COMPLIANCE OF INTRAPULMONARY ARTERIES AND VEINS. *J. Appl. Physiol., vol. 19:1202-1206, 1964. 13 refs.*

A method was developed that permitted changes in the pressure-volume characteristics of large intrapulmonary vessels occurring with changes in the composition of alveolar gas to be studied in excised lungs. The capillary bed was emptied by keeping intravascular pressure well below alveolar pressure, and the relationship between changes in the volume of the pulmonary arteries or veins with changes in transpulmonary pressure was measured. The volume of the arteries and veins always decreased with a decrease in transpulmonary pressure, but when the alveoli contained carbon dioxide, the decrease in vascular volume was less, for the same decrease in transpulmonary pressure, than when the alveoli contained oxygen or nitrogen without carbon dioxide. This change with carbon dioxide was probably due to a decrease in the compliance of the larger intrapulmonary arteries and veins. Since there was no pathway for CO2 to enter these vessels except by diffusion from the alveoli, the CO2 can act directly on the intrapulmonary arteries and veins to reduce their compliance, but it is not known whether this effect has physiological significance. No effect on the large pulmonary vessels was found with variations in alveolar concentrations of oxygen. All experiments were performed on excised lungs of dogs. (Author abstract modified)

### 1962

**41055** **APTIC NO. 60738**

Hueper, W. C. and W. W. Payne

EXPERIMENTAL STUDIES IN METAL CARCINOGENESIS. *Arch. Environ. Health, vol. 5:445-462, Nov. 1962. 82 refs.*

The results of laboratory experiments in which animals were exposed by various routes to chromium compounds, metallic nickel, metallic iron, and arsenious oxide are reported along with their implications concerning animal and human carcinogenesis. Both hexavalent and trivalent chromium showed carcinogenic properties in rats, particularly those compounds of both species that were highly water-soluble. The tumor yield obtained by repeated intratracheal instillation of suspensions of three carcinogenically highly potent chromates, calcium chromate, zinc chromate, and strontium chromate, was remarkably low and limited to the formation of sarcomas in the lung. Immunochemical investigations with chromium-protein complexes showed that such agents are capable of eliciting chromium-specific antibodies; tests for the presence of immune bodies in the serum of chromate producers gave equivocal results. Occupational lung cancer hazards may be assumed to be not limited to chromate makers and producers and to packers of chrome pigments but rather to extend to members of all occupations in which there is respiratory contact with various chromium compounds. Powdered nickel implanted intrapleurally into rats elicited cancers in about one-third of the animals, while intrapulmonary deposited nickel powder produced intrapulmonary sarcoma in only one of 34 rats. The inhalation of powdered metallic nickel in combination with sulfur dioxide by rats and hamsters did not give rise to lung tumors in any of two species studied suggesting that the combined action of a purely irritative chemical, such as sulfur dioxide, with a carcinogen does not necessarily induce a carcinogenic response by the lung. Rats implanted intrapleurally with finely powdered chemically pure iron or fed arsenic dissolved in water or a 12% alcoholic solution did not develop any cancers in the target organs.

## EFFECTS-PLANTS AND LIVESTOCK

### 1974

**41056** **APTIC NO. 64815**

Arndt, Uwe

THE KAUTSKY-EFFECT: A METHOD FOR THE INVESTIGATION OF THE ACTIONS OF AIR POLLUTANTS IN CHLOROPLASTS. *Environ. Pollut., 6(3): 181-194, April 1974. 32 refs.*

The characteristic variable fluorescence of green plants (Kautsky-effect) was used to investigate the effects of air pollutants on metabolic reactions in chloroplasts. This technique in conjunction with oxygen measurements and pigment analysis gave an indication of effects-mechanisms for particular heavy metals such as copper, manganese, and zinc, as well as for sulfur dioxide. An example of the routine use of the Kautsky-effect in the testing of the toxicity of settled dusts is described. (Author abstract modified)

**41057** **APTIC NO. 64945**

Brunold, C. and K. H. Erismann

HYDROGEN SULFIDE AS A SOURCE OF SULFUR IN LEMNA MINOR L.: ITS INFLUENCE ON GROWTH, SULFUR CONTENT AND SULFATE UPTAKE. *(H2S als Schwefelquelle bei Lemna minor L.: Einfluss auf das Wachstum, den Schwefelgehalt und die Sulfataufnahme). Text in German. Experientia, 30(5):465-467, 1974. 25 refs.*

The effect of various concentrations of hydrogen sulfide on the growth, sulfate content, and sulfate uptake in Lemna minor L. was studied. Lemna minor was viable when cultivated in air containing 6 ppm H2S for 36 days. While this H2S concentration caused a slight decrease in the rate of photosynthesis, concentrations above 60 ppm caused a rather abrupt drop in the photosynthetic activity. Pronounced increase in the sulfate content in Lemna minor after cultivation at 6 ppm for 36 days were observed. In a short-term experiment, 18 ppm H2S caused rapid decrease in the sulfate uptake by Lemna minor partly due to the adenosine triphosphate deficiency.

**41058** **APTIC NO. 64481**

Fleischer, R. L. and F. P. Parungo

AEROSOL PARTICLES ON TOBACCO TRICHOMES. *Nature (London), 250(5462): 158-159, July 12, 1974. 2 refs.*

It is possible that sub-micron aerosols may contact and be incorporated into the sticky tips of tobacco trichomes. These aerosols may contain radioactivity. During tobacco curing, the sticky exudate polymerizes to encapsulate the aerosols in highly insoluble particles. When smokers inhale smoke they may inhale these aerosols which can be deposited in the lungs. Thus, the radioactive aerosols may have long residence times in the deep lungs. To prove this hypothesis, trichomes from North Carolina flue-cured and Turkish air-cured tobacco leaves were examined for elements heavier than neon in particles down to 250 A in diameter. Silicon, sodium, chlorine, calcium, and potassium occurred frequently, iron and lead occasionally. Aerosols of greater than 0.5 micrion diameter were analyzed individually on the surface of trichomes. They were attached to most of the trichome tips of the North Carolina Tobacco and to half of those on Turkish tobacco. Iron, silicon, and chlorine were found in the particles, implying that the particles were silicate minerals and salt. Thus, the tips and particles on them contained elements commonly associated with both continental and marine aerosols. Previous investigations proved that radon daughter radioactivity is present in trichomes; this study showed that the aerosols which normally carry this radioactivity are present in the tips.

**41059** **APTIC NO. 63167**

Garrec, J.-P., E. Ligeon, A. Bontemps, R. Bligny, and A. Fourcy

EXACT LOCALIZATION OF FLUORINE ALONG POLLUTED NEEDLES OF ABIES ALBA BY PROTON MICROANALYSIS. *(Localisation exacte du fluor le long d aiguilles polluees d Abies alba par microanalyse au moyen de protons). Text in French. J. Radioanal. Chem., 19(2): 359-365, 1974. 10 refs.*

The distribution of fluorine on and near the surface of contaminated needles of Abies alba was studied by proton bombardment, using direct detection of the alpha rays generated during the reaction of F(19) with oxygen. The method is rapid and has a sensitivity of 10 micrograms/g fluorine. Accumulation of fluorine in the necrotic apical zone of the needle in concentrations reaching up to 60,000 micrograms/g, and a slighter degree of accumulation in a narrow zone separation the necrotic from the intact zone of the needle were found. The fluorine concentration in the necrotic apical zone increased rapidly with age, while that in the boundary zone diminished and fell to zero after a certain age. The fluorine concentration was higher in the upper than in the lower surface of the needles.

**41060** **APTIC NO. 64808**

Genderen, J. L. van

REMOTE SENSING OF ENVIRONMENTAL POLLUTION ON TEESSIDE. *Environ. Pollut., 6(3): 221-234, April 1974. 41 refs.*

The methods and procedures most useful for the detection of vegetation stress resulting from the various forms of environmental pollution were studied in the industrial area of Teesside, England. There is a need for a carefully integrated program of image analysis, as well as for field and laboratory methods. Sequential aerial multiband photography is an extremely useful technique for plotting the spread of industries and pollution with time, as well as for examining the changes in vegetation and land use. Color infrared film is considered to be the most useful remote sensing device for vegetation stress determination, since plants under stress are usually accompanied by a loss of infrared reflectance from the affected verdure. Image enhancement techniques are useful tools in delimiting certain areas under stress. The use of multiband photography, together with other remote sensing techniques, can greatly assist in the determination of areas of vegetation stress. (Author abstract)

**41061** **APTIC NO. 63148**

Hampp, Ruediger and Wolfgang Hoell

RADIAL AND AXIAL GRADIENTS OF LEAD CONCENTRATION IN BARK AND XYLEM OF HARDWOODS. *Arch. Environ. Contam. Toxicol., 2(2):143-151, May 1974. 16 refs.*

The bark and wood tissues of the hardwood trees Robinia pseudoacacia L., Tilia cordata Mill., and Acer platanoides L., grown in different localities of Munich with varying traffic intensity, were quantitatively analyzed for lead content in both radial and axial directions. In comparison to the non-heartwood- forming genera (Tilia, Acer), the heartwood-forming Robinia showed distinct differences in radial distribution of lead -- the sapwood of Robinia had higher lead concentrations than the heartwood. The innermost heartwood zone of this species had a higher lead content than did the younger heartwood tissue. In Tilia and Acer, the wood zones of different ages did not exhibit significant differences in their lead concentrations. The bark surface showed a high lead concentration which could be washed off to a large extent with water. The lead concentration in the trunk of Robinia increased in the basipetal direction. The lead content in the bark and sapwood of this species was proportional to the traffic intensity in the neighborhood. The results are discussed in relation to the possible translocation of lead within the trees. (Author abstract)

**41062** **APTIC NO. 63260**

Hirao, Yoshimitsu and Clair C. Patterson

LEAD AEROSOL POLLUTION IN THE HIGH SIERRA OVERRIDES. NATURAL MECHANISMS WHICH EXCLUDE LEAD FROM A FOOD CHAIN. *Science, 184(4140):989-992, May 31, 1974. 9 refs.*

Most of the lead contained in sedge leaves and vole mountain meadow mice within one of the most pristine, remote valleys in the U. S. is not natural, but comes from smelter fumes and gasoline exhausts. The mice were studied in Thompson Canyon in the crest of the High Sierra mountains. Isotopic compositions of Thompson Canyon leads and urban sources were used to determine the origin of the Thompson leads. About 97% of the lead entering the Canyon was of industrial origin, and 98% of the lead entering the valley remained there. Lead deposition and snow lead input, lead output, lead in humus, metals in food chain (calcium, strontium, barium, and lead), and lead in sedge leaves and vole tissues were measured. In a food chain, natural mechanisms do not allow lead to accompany the bulk of the nutritive metals as they proceed to higher trophic levels. This exclusion can be expressed quantitatively by a comparison of lead/calcium ratios at successive tropic levels. This ratio decreased by an overall factor of 200 in proceeding from rock to soil moisture to sedge to vole. This factor would have been 1200 if lead aerosols had not collected on sedge leaves and circumvented the tendency by sedge to exclude lead from the nutritive metals it absorbed from soil moisture. (Author abstract modified)

**41063** **APTIC NO. 63187**

Kirschbaum, U., R. Klee, and L. Steubing

AIR QUALITY MEASUREMENTS ON ACCOUNT OF IMMISSION INFLUENCES ON LICHENS - LICHENS AS BIO-INDICATORS. *In: Air Hygienic Meteorological Model Studies of the Lower Main Region. Report 5. Regional Planning Assoc., Lower Main Region, Frankfurt am Main (West Germany), p. 116-127, June 1974. 10 refs.*

At 150 observation stations the bark of apple trees was examined for lichen growth. At each station 10 apple trees were thus examined. The limitation to one type of tree was to ensure that essential factors for lichen growth - with exceptance of the emission factor - would be as constant as possible. From the lichen growth it was possible to calculate the air purity index according to Le Blanc and De Sloover. A summary of the lichen indices of similar value results in zones as shown on a map. There is a clear relation to the main pollution source (Frankfurt) and to the prevailing wind direction: as the distance from the city grows the living conditions for lichens improve gradually. However, on the leeside of the densely populated area lichen growth conditions improve later than in other directions. Of the examined lichens, Lecanora varia is not suitable as a bio- indicator because its toxic tolerance is too high; Evernia prunastri is already so scarce that it can no longer be used as an indicator close to the city. The most suitable species was Hypogymnia physodes. It was therefore used for exposure tests in various pollution areas. A significant correlation was found between the results of the exposure tests and the results of observations of the lichen growth on trees. Lichen explants can therefore be used for gaining information on the state of air pollution within short periods of time. A connection between lichen growth and pollutant concentration could also be observed. A table of the sulfur dioxide tolerance of various lichen species is given.

**41064** **APTIC NO. 63312**

Little, P. and M. H. Martin

BIOLOGICAL MONITORING OF HEAVY METAL POLLUTION. *Environ. Pollut., 6(1):1-19, Jan. 1974. 21 refs.*

A simple, inexpensive technique is described for detailed monitoring of airborne metal pollution using Sphagnum moss suspended in fine nylon hair-nets from natural vegetation. The technique was used to monitor pollution, month by month, at 47 sampling points near a zinc and lead smelting complex at Avonmouth, near Bristol, England. Maps of the area were constructed by computer, depicting the levels and patterns of distribution of Zn, Pb, and cadmium collected by the moss bags. The results are related to wind data, localized climatic conditions, and topography. The reliability and practical significance of this simple biological monitoring technique is discussed, with particular reference to the collection and retention of metals by natural vegetation. A comparison is made between moss bags and other monitoring devices. Sphagnum bags should be at least as valid as deposit gauges, if not more so. (Author abstract modified)

**41065** **APTIC NO. 64758**

Matsuoka, Y.

PLANT DAMAGES DUE TO AIR POLLUTION, PART VII: DAMAGES OF AGRICULTURAL CROPS DUE TO HYDROGEN FLUORIDE. *(Taiki osen ni yoru shokubutsu higai (7) fukka suiso ni yoru nosakumotsu no higai). Text in Japanese. Nogyo Oyobi Engei (Agr. Hort.), 49(7):1-2, July 1974.*

Hydrogen fluoride, silicon tetrafluoride, and other fluorine compounds are toxic to plants. Silicon tetrafluoride converts to HF, causing HF toxic symptoms to plants. Aluminum refineries, steel plants, superphosphate firms, and potteries emit fluorides. Hydrogen fluoride causes long-term damage at 1-5 ppb and acute damage at 10-50 ppb. Rice plants exposed to 50 ppb HF for 48 hr were severely damaged. Rice plants near an aluminum refinery were also damaged. Welsh onions exposed to 30 ppb HF for 6 hr and photographed after 48 hr and red clover exposed to 70 ppb for 11 hr and photographed after 48 hr were also damaged.

**41066** **APTIC NO. 64491**

Matsushima, J.

SYMPTOMS OF FRUIT TREE INJURIES BY OZONE. *(Ozon ni yoru kaju no higai shojo). Text in Japanese. Nogyo oyobi Engei (Agr. Hort.), 49(6):1-2, June 1974.*

The characteristic symptom of fruit trees exposed to ozone is stippling on the upper surface of leaf blades. Freckle-like spots appeared on the upper surface of Prunus mume experimentally exposed to 0.2 ppm of atmospheric ozone 4-5 hr daily for 4 consecutive days in March. Similar freckle-like spots appeared on the upper surface of the leaf of Malus sieboldii exposed to 0.5 ppm of atmospheric ozone for 5 hr/day for 2 days. Injuries appear mainly on the completely developed newly grown leaves and on older ones. Other symptoms include chlorosis and necrosis of leaves. The species specificity of fruit trees to ozone is the same as that to sulfur dioxide, evergreens being more resistant than deciduous trees. Photographs are shown.

**41067** **APTIC NO. 64757**

Matsushima, J.

PLANT DAMAGES DUE TO AIR POLLUTION, PART V: DAMAGE OF FRUIT TREES DUE TO EXPOSURE TO SO2. *(Taiki osen ni yoru shokubutsu higai (5) nisanka io ni yoru kaju no higai). Text in Japanese. Nogyo Oyobi Engei (Agr. Hort.), 49(5):1-2, May 1974.*

Fruit trees are generally less sensitive than other trees to sulfur dioxide; apples, grapes, and peaches are the most sensitive fruit trees and show early lesions after exposure for 1 hr to 2-3 ppm SO2. Evergreen trees are generally less sensitive than citrus trees, showing smoky spots after exposure for 1 hr to 8 ppm SO2. Near a refinery, pollution caused fruit to fall, but did not cause lesions on the fruit. Pear leaves developed smoky spots after exposure for 6 hr to 5 ppm of SO2. Small pox-like spots formed on Satsuma oranges and pears after exposure to floating dust containing adsorbed SO2.

**41068** **APTIC NO. 63268**

Noller, B. N. and L. E. Smythe

DISTRIBUTION OF LEAD IN VEGETATION BORDERING ROADS IN THE SYDNEY METROPOLITAN AREA. *Search, 5(3):108-110, March 1974. 19 refs.*

A survey on the distribution of lead in vegetation bordering roads in the Sydney, Australia metropolitan area is summarized. Samples of plants were taken from six sites covering a range of daily traffic volumes from Oct. 1971 to July 1972. All samples were taken from the same sites within 20 ft of the roadway except for an area of virgin bushland, away from traffic. Each plant sample was divided into two, and one half was washed in 0.1% solution of non-ionic detergent and rinsed four times in distilled water; the remaining half was left unwashed. The results from all sites are tabulated. In nearly every case the value of the washed sample is lower indicating removal of material adhering to the plant surface. Careful washing reduces the Pb content to levels about equal to those observed some distance from the highway. The effectiveness of washing techniques in removing Pb from plants was related to the nature of the plant s surface.

**41069** **APTIC NO. 64427**

Oelschlaeger, W.

HARMFUL EFFECTS OF FLUORIDE. *(Fluorschadenswirkungen). Text in German. Ziegelind. (Wiesbaden), no. 4:169-174, 1974.*

Studies and observations on the harmful effects of fluoride emissions from various industrial sources on plants and animals are reviewed. Fluorine, hydrofluoric acid, and other gaseous fluorides are most dangerous to plants, and especially to Conifera. Entering through the stomata such fluorides cause necroses and interfere with metabolic processes. The harmful effects are influenced by such factors as solar radiation, water budget of the soil, relative humidity, and fertilization. Fluorisis in cattle, manifesting itself in bone lesions such as periostal hyperostosis and exostoses, and causing production losses, is due to fluorine present in and on plants ingested. The fluorine tolerance for cattle is proposed to be set at 40 ppm in forage.

**41070** **APTIC NO. 63316**

Przybylski, Zdzislaw

RESULTS OF OBSERVATION ON THE INFLUENCE OF SULFUROUS GAS AND VAPORS ON FRUIT TREES, SHRUBS, AND ARTHROPODS AROUND THE SULFUR MINES AND PROCESSING PLANTS IN THE TARNOBRZEG REGION. *(Resultats d observations relatives a l influence des gaz et vapeurs de soufre sur les arbres fruitiers, arbustes et arthropodes aux alentours des usines et mines de soufre dans la region de Tarnobrzeg). Text in French. Environ. Pollut., 6(1):67-74, Jan. 1974. 4 refs.*

The effects of and the damages due to sulfur dioxide, sulfur trioxide, and sulfuric acid emissions on plants and arthropods around a sulfur mine and sulfuric acid production plant in Tarnobrzeg in Poland were studied in a 3-kilometer radius. Discoloration and early loss of the foliage in fruit trees, and the loss of green foliage without apparent changes in brush, conifera, and other wild trees were observed. Many trees in that region died due to exposure. Prunus avium L., Prunus cerasus L., Secale cereale L., Triticum vulgare Vill., Conifera, Quercus sessilis Ehrh., Tilia parvifolia Ehrh., Carpinus betulus L., Betula verrucosa Ehrh., Corylus avellana L., and Sambucus nigra L. were especially susceptible to the emissions, while Alnus sp. Mill., Syringa vulgaris L., Jugland regia L., Solanum tuberosum L. and Beta vulgaris var. saccharifera Lnge. were among the most resistant species. Absence or reduced number of arthropodes around the sulfur works was observed. Specimens of Carabidae, Cantharididae and Tettigoniidae were not found nearby the sulfur works, which indicates that these species can be used as indicators of SO2 emissions.

**41071** **APTIC NO. 63057**

Sakamoto, Clarence M. and Ray E. Jensen

QUARTERLY REPORT ON EFFECT OF CLIMATIC CHANGE ON NON-DOMESTIC WHEAT PRODUCTION. *National Oceanic and Atmospheric Administration, Auburn, Ala., Environmental Study Service Center, Department of Transportation Climatic Impact Assessment Program Proj. DOT-AS- 400006, 89p., 1974. 34 refs.*

Engine effluents from aircraft in the stratosphere and other pollutants could alter the global energy balance. This could cause changes in mean temperature, wind precipitation, and solar radiation at four divisions of latitude (0-20 deg, 20-40 deg, 40-60 deg, and 60-90 deg) for four cases of change in solar radiation. The possible effects of these four cases at these four latitudes on nondomestic wheat production are reviewed. Argentina, Australia, Canada, China, India, and the USSR are considered. The requirements of wheat involving weather and soil are discussed. The historical effects of weather changes on production are described. General characteristics of wheat and characteristics of the wheat producing areas are also discussed.

**41072** **APTIC NO. 64447**

Sawada, M. and H. Akiyama

INVESTIGATION OF PHOTOCHEMICAL SMOG BY MORNING GLORY: DETERMINATION OF POLLUTANT CONCENTRATION BY OBSERVING THE CHANGE OF LEAVES. *(Asagao de kokagaku sumoggu o chosa - ha no henka de osen nodo o sokutei). Text in Japanese. PPM (Japan), 5(7):74-81, July 1974.*

In Japan leaf changes in morning glory has been used to determine quantitatively oxidant concentrations. White spots on the upper side of the leaf indicate slight damage, and spot-like perforations of the leaf shows a severa case. Annual plants and deciduous trees are most susceptible to oxidants. Appropriate plant indicators must be susceptible to oxidants broadly cultivated, show most conspicuous damage to the naked eye, and be resistant to disease and harmful insects. The degree of damage to Morning glories was classified into three levels indicated by a water soaked-like state, peripheral white spots and greyish- whitening of leaf blade slowly turning to black specks, and finally brownish blackening and curling of the leaf-blade. These phenomena correspond respectively, to 0.15 ppm (1-2 hr), 0.15-0.2 ppm, and more than 0.2 ppm (daily oxidant dose) (9 am to 4 pm) of 100 ppm (cumulative of hourly average value).

**41073** **APTIC NO. 64721**

Schuschke, G., U. Mielke, and H. D. Schulze

BARK DWELLING LICHENS AS AIR HYGIENIC BIOINDICATORS IN MADGEBURG. *(Rindenbewohnende Flechten als lufthygienischer Bioindikator in Magdeburg). Text in German. Z. Ges. Hyg. Ihre Grenzgebiete (Berlin), 20(7):415-421, 1974. 27 refs.*

Examination of the lichen growth in the town of Magdeburg (German Democratic Republic) revealed that throughout the entire city area only one kind prevailed, lecanora, varia. Three growth zones could be distinguished, the lichen desert with no lichen growth at all, a zone of struggling growth covering less than 50% of the reference area, and a normal zone with a growth covering more than 50% of the reference area. No lichen growth was found in the city center and in the industrial areas; struggling lichen growth was found in the suburbs and in a large park stretching out between two arms of the Elbe river in the city center. Normal growth was found only in the areas bordering the town. Comparison with dust fall measurements taken over an earlier 3-yr period reveals that the measuring points yielding annual average dust concentration of less than 15 g/sq m/30 days were located in the normal growth zone. In the zone with struggling growth the stations measured annual average dust concentrations between 16 and 20 g/sq m 30/days. A dust fall of more than 20 g/sq m/30 days was measured exclusively in the zone without lichen growth. The relative coefficient of contigency by Pearson was 0.938. A total of 54 plates holding a total of 540 individual lichen samples of Parmelia physodes exposed at 8 stations yielded a significant correlation between dying sequence of the lichen samples and the sulfur dioxide concentration. The information which can be drawn from exposure tests with lichens or from determination of the lichen growth in a particular area is limited and inferior to emission and immission measurements.

**41074** **APTIC NO. 64424**

Takasaki, Tsuyoshi, Yoshihiro Matsuoka, Masaki Morikawa, and Koji Shiratori

THE ESTIMATES OF AIR POLLUTION BY THE LEAF ANALYSIS METHOD. *(Yobunsekiho ni yoru taiki osen jokyo no suisoku). Text in Japanese. Chiba-ken Nogyo Shikenjo Kenkyu Hokoku (Bull. Chiba-ken. Agr. Exp. Sta.), no. 14:119-124, 1974. 13 refs.*

The leaf analysis method is examined in terms of estimating the influence of air pollution on agriculture. Selection of the following conditions were found important for applying leaf analysis to the exact determination of the state of air pollution: location, the crop, time and method of collection of leaf samples, and the analysis procedure. Estimates of the range and degree of air pollution by the leaf analysis method agreed with data obtained from instruments. The assumption was made that the volume of air-polluting elements accumulated in leaves was the total of air pollution during the leaf life. The relation between growth suppression and the composition of air pollutants in leaves is expected to pave the way for quantitative determination of the damage by air pollution upon crops.

**41075** **APTIC NO. 63193**

**Tanaka, Hirofumi, Toshiharu Takanashi, and Michihiko Yatazawa**

EXPERIMENTAL STUDIES ON SO2 INJURIES IN HIGHER PLANTS. III. INHIBITORY EFFECT OF SULFITE ION ON 14CO2 FIXATION. *Water, Air, Soil Pollut., 3(1):11-16, March 1974. 11 refs.*

Photosynthesis decreases reversibly in plants exposed to sulfur dioxide. Photosynthesis recovers when the exposure to SO2 is discontinued. Inactivation of a photosynthetic enzyme, ribulose-1,5-diphosphate carboxylase, by sulfonation of its sulfhydral groups was investigated as a cause of the reversible reduction of photosynthesis. The relationship between the sulfite ion concentration in the reaction mixture and carbon (14) dioxide fixation catalyzed by the enzyme which was prepared from alfalfa leaves was explored using radioactive sodium bicarbonate. About 50% and 85% inhibitions of 14CO2 fixation were observed at .003 M and .03 M concentration of sulfite ion in the reaction mixture, respectively. The accumulation of .0003 M sulfite ion on the reaction site of the enzyme involved in the plants which were exposed to SO2 could considerably reduce the CO2 assimilation of the plant. (Author abstract)

**41076** **APTIC NO. 63277**

Ueno, Eiko

STUDIES ON ENVIRONMENTAL CONTAMINATION BY MANGANESE -- EXPERIMENTAL PLANTING OF YOUNG JAPAN CEDAR. *(Mangan ni yoru kankyo osen no hyoka ni kansuru kenkyu:suginae shiken shokuju ni yoru shokubutsutai kakubu no Mn ryo). Text in Japanese. Shikoku Igaku Zasshi (Shikoku Acta Medica), 30(1):10-18, Feb. 25, 1974. 12 refs.*

Young Japanese cedars were planted in experimental nursery blocks. The first group of cedars was cultivated in the blocks in soil containing 20, 100, 200, or 400 g of manganese sulfate. The second group was exposed to a mist of 2, 10, 20, or 40 g of manganese sulfate solution by a sprinkler once a month for 6 mo after planting. The manganese concentrations were determined in each part of the plant taken from each block every month. The manganese in the soil was also determined. In proportion to the dose, marked Mn accumulation was observed in every part of the cedar except for the 20 g group. The accumulation proceeded especially in both old and fresh leaves. In the first group, the accumulation reached the highest level in June or July, 1 or 2 mo after planting, and then gradually decreased; but it was still at a considerably higher level than the control at the end of the experiment. In the second group, the Mn accumulation reached the highest level in August and kept that level during the following period. The findings suggest that the leaves of the Japanese cedar, which can easily be obtained any time and everywhere in Japan, would be a useful indicator for Mn environmental contamination, especially for airborne Mn.

**41077** **APTIC NO. 63147**

Ward, N. I., R. R. Brooks, and R. D. Reeves

EFFECT OF LEAD FROM MOTOR-VEHICLE EXHAUSTS ON TREES ALONG A MAJOR THOROUGHFARE IN PALMERSTON NORTH, NEW ZEALAND. *Environ. Pollut., 6(2):149-158, Feb. 1974. 8 refs.*

The effect of lead from motor vehicle exhausts on trees growing along a busy thoroughfare in Palmerston North, New Zealand, was investigated. Analysis of tree samples (leaves, bark, and trunk cores) and of soils, showed that the distribution of emitted lead was influenced by the direction of the prevailing wind. Lead levels were higher on the sides of trees facing traffic. Measurements of lead concentrations in leaves, bark, and soils showed considerable accumulation in the vegetation at distances of about 5 m from the main traffic movement. Lead levels increased from ground level up to 1-2 m, then decreased. (Author abstract modified)

**41078** **APTIC NO. 64445**

The Section for Environmental Protection, Ota Ward, Tokyo

INTERIM REPORT OF THE SURVEY ON THE EFFECTS ON PLANTS (OF AIR POLLUTION). *(Ota-ku Shokubutsu Eikyo Chosa Hokokusho -Chukan Hokoku). Text in Japanese. 101p., March 1974.*

Toxic tolerances of trees and acute injury of morning glory by air pollution are investigated. The growth and health of Zelkova serrata, Poplar, Ginkgo Biloba, Ligustrum japonicum, and Quercus myrsinaefolia, which were transplanted in 1972 to eight public gardens in Ota Ward, were examined. A local difference in the growth of Zelkova serrata was noticed, and those planted near Tokyo Bay were inferior. No local difference was observed of the growth of G. B., L. j, and Poplar. The growth of Quercus myrsinaefolia was generally bad. The state of injuries was not as severe as the 1972 investigation. The acute injuries of morning glory transplanted in the above mentioned eight public gardens indicated air pollution all over the ward, no local differences of air pollution, a comparison of the injuries between the trees and morning glory was not possible.

## 1973

**41079** **APTIC NO. 64669**

Honda, Hitoshi

AIR POLLUTION PLANT INDICATORS. *(Shokubutsu ni yoru taiki osen shihyo ni tsuite). Text in Japanese. In: Investigation of Air and Water Pollution on Human Health. Chiba Prefectural Government (Japan), Dept. of Hygiene, p. 53-65, May 1973.*

Plant growth is governed by natural environmental factors such as weather, climate, and soil and man-made factors of environmental pollution. In the major polluted cities, the effects of air pollution on green plants were investigated. The various manifestations are classified into visible and invisible symptoms and subdivided into chronic and acute symptoms on each part of the plants. Commonly observed symptoms are abnormal defoliation, partial change in leaf color, and various types of necrosis in chloroplast and mesophyll. The branch becomes thinner and shorter, which results in a decrease in leaf number and flowers. The flowering of fragrant olive in metropolitan Tokyo was investigated, and substantial deteriorations in anthesis were observed. The effect of protective planting on the growth of the Someiyoshino cherry tree was tested in Hibiya Park. A highly sensitive response to the environment was indicated. The effects on the stem, tree form, and physiological functions were also investigated. Susceptibility to sulfur dioxide was tested using a SO2 gas chamber. Of 35 species tested, more than half showed a high degree of susceptibility with damaged area index higher than 60%.

**41080** **APTIC NO. 64423**

Imaizumi, Seiko

RELATION BETWEEN OZONE INJURY AND STOMATAL BEHAVIOR OF TOBACCO LEAVES. *(Tabako no ha no ozon shogai to kiko to no kankei ni tsuite). Text in Japanese. Hatano Tabako Shikenjo Hokoku (Bull. Hatano Tob. Exp. Stn.), 73(3):17-22, March 1973. 15 refs.*

Direct microscopic observation techniques were used to investigate the relation between stomatal behavior of tobacco leaves and ozone injury. Stomatal apertures of ozone-susceptible tobacco varieties were wider than those observed in resistant varieties, with the extent of ozone injury paralleling the degree of stomatal aperture. Young and small stomata, such as those found on the upper portion of leaves, showed rapid response to ozone, while older and larger stomata showed resistance to closing. Stomatal responses were slow when the leaves were treated with low concentrations of ozone; high concentrations of ozone resulted in the development of irreversible dehydration symptoms regardless of stomatal aperture.

**41081** **APTIC NO. 60961**

Keller, Theodor

ON THE PHYTOTOXICITY OF PARTICULATE FLUORINE COMPOUNDS. *(Zur Phytotoxizitaet staubfoermiger Fluor-Verbindungen). Text in German. Staub, Reinhaltung Luft, 33(10):395-397, Oct. 1973. 8 refs.*

The effects of sodium fluoride, calcium fluoride, and cryolite on seedlings of Pinus silvestris, Pseudotsuga menziesii, and Betula verrucosa were studied in laboratory experiments. The fluorine compounds were sprayed on the plants in the form of small particles. Sodium fluoride alone induced visible symptoms of partial or total necrosis of the needles in Pinus silvestris. All dusts caused a statistically significant depression of photosynthesis in birch. Calcium fluoride and cryolite may also exert a phytotoxic action classified as invisible injury. In the tested conifera, the depression of photosynthesis was statistically not significant in the absence of visible symptoms of injury. The reduced toxicity of these dusts in conifera is most probably due to the well-developed cuticula and the resin and wax excretions by the needles. The increased susceptibility of conifera growing around aluminum works may be due to gaseous fluorine compounds. All dusts had an increased toxicity and photosynthesis-depressing effect in air with high relative humidity.

**41082** **APTIC NO. 63236**

Matsumoto, Hiromi, Takashi Sumimoto, Shigehiko Matsumoto, and Nobuaki Izumo

AN INVESTIGATION OF LEAD-POLLUTION OF SOIL BY AUTOMOBILE EXHAUST GASES IN KAGOSHIMA-PREFECTURE. *(Kagoshima-ken no jidosha haikigasu ni yoru dojo no enosen chosa ni tsuite). Text in Japanese. Kagoshima-ken Kogai Eisei Kenkyusoho (Rep. Kagoshima Prefect. Inst. Pollut. Pub. Health), no. 9:104-106, Aug. 1973.*

The lead pollution by automobile exhaust gas is becoming a serious concern with the rapid increase in number of automobiles. At 20 measuring points set along the major highways and at intersections, the lead concentration which accumulated in soil was measured. The upper layer (surface layer) and lower layer (layer at 10 cm from the ground surface) of soil were sampled over a period from April 1972 through March 1973. The lead concentration in soil was determined by the atomic absorption and spectrophotometric methods. The lead concentration of the upper layer ranged from 18.5 to 168.5 ppm and the lower layer from 13.0 to 205.0 ppm. The ratios of lead in upper and lower layers are given, indicating the higher concentration in the upper layer in most cases. The natural soil contains a certain amount of lead, therefore it is difficult to assess the extent of lead pollution by automobile exhaust gas from the result of one survey. The lead concentration in Kagoshima city is higher than that of other smaller cities, which may possibly be the indication of pollution by automobile exhaust gas.

**41083** **APTIC NO. 64879**

Ohara, A.

EXPERIMENTS ON PROTECTING TREES FROM ENVIRONMENTAL POLLUTION. PART I: THE INFLUENCE OF AIR POLLUTION ON TREES. *(Jumoku no kogai boshi shiken 1. Taiki osen no jumoku ni oyobosu eikyo). Text in Japanese. Fukui-ken Ringyo Shikenjo Hokoku (Annu. Rep. Fukui Prefect. For. Exp. Stn.), no. 11:185-189, 1973.*

The amount of exhaust and dust emitted from vehicles is generally larger during stopping, starting, and slow driving due to traffic jams than in high speed running; the degree of air pollution was therefore investigated by measuring the amount of dust deposited on the leaves of streetside trees near a road crossing in Fukui City. The species investigated was Magnolia kobus and four to 13 leaves per plant were collected at the same height from the ground within an area of 500 m. The dust was washed with water, recovered by evaporation, air dried at 105 C, and calculated per 100 sq cm of leaf-surface. Dust gradually increased on the trees 200 m from the crossing, reached the maximum just before the crossing, reaching a second maximum at 330 m from the crossing, and then decreased slowly. The average number of cars passing the crossroads was 7835/hr from 8:00 am to 6:00 pm. The maximum and minimum of dust per 100 sq cm were respectively 134.5 and 7.9 mg during the investigation for 3 consecutive years.

**41084** **APTIC NO. 64880**

Ohara, A.

EXPERIMENTS FOR PROTECTING TREES FROM ENVIRONMENTAL POLLUTION. PART II: GROWTH TEST OF TREE SPECIES. *(Jumoku no kogai boshi shiken 2. Ryokuchi jushu no seiiku shiken). Text in Japanese. Fukuiken Ringyo Shikenjo Hokoku (Annu. Rep. Fukui Prefect. For. Exp. Stn.), no. 11:190, 1973.*

In order to identify plant species resistant to automobile-emitted exhaust and dust, six species of trees were transplanted along a national road in Fukui City on March 27, 1973. The growth of these trees will be observed at appropriate intervals. The species were Ternstroemia japonica (0.53 m average height and 1.12 cm average diameter), Camellia sasanqua (1.18 m and 1.4 cm), Juniperus chinensis (1.20 m and 1.89 cm), Rhododendron indicum (0.32 m and 35 cm), another species of Rhododendron (0.40 m and 40.0 cm), and another species of Juniperus (0.26 m and 22 cm).

**41085** **APTIC NO. 63255**

Prica, Vladimir

ACCUMULATION DYNAMICS OF TOTAL SULPHUR IN LEAVES OF SOME FRUIT TREES IN THE CONDITIONS OF AERIAL POLLUTION. *(Dinamika nagomilavanja ukupnog sumpora u listu nekih vocaka u uslovima aerozagadenja kao pokazatelja zagadenosti vazduha). Text in Serbo-Croatian. Savremena Poljopr., 21(11-12):83-94, 1973. 8 refs.*

The accumulation dynamics of the total sulfur in leaves of selected fruit trees were followed in order to establish whether total sulfur analyses can be used as an indicator of the level of pollution by sulfur dioxide. Analyses were performed on fully developed leaves of uniform age which were without necrotic damage by SO2. All examined varieties retained their natural feature to accumulate S in leaves during vegetation both in unpolluted and polluted localities, with the consequence of SO2 presence being the difference in levels of S accumulation. The process of accumulation and final results were determined through the examination of fruit varieties, climatic conditions, and localities. The analysis of total S in a developed leaf performed in July and September was a reliable indicator of the pollution levels in certain localities near a pollution source. Necessary conditions were the choosing of a suitable plant-indicator and levels of pollution that were sublethal. The best plant indicator found was a plum tree at the stage of full fruit bearing, with leaf samples being taken from the outer twigs.

**41086** **APTIC NO. 62894**

Pyatt, F. Brian

SOME ASPECTS OF PLANT CONTAMINATION BY AIRBORNE PARTICULATE POLLUTANTS. *Int. J. Environ. Studies, vol. 5:215-220, 1973. 14 refs.*

The development and effects of industrialization in the steel producing town of Port Talbot in South Wales, U.K. The relative degree of plant contamination by particulate pollutants is assessed as a rapid, inexpensive, and easily applied method of detection of airborne particulate pollutants. The average weight of particulates on the leaves decreased fairly regularly with increasing distance from Port Talbot, except in an area near a motorway. Some of the effects of environmental factors on the degree of deposition are examined, including wind, height of leaves, and rain. (Author abstract modified)

**41087** **APTIC NO. 63040**

Sapetti, Carlo, Enza Arduino, and Paolo Durio

LEAD POLLUTION: LEAD CONTENT IN MILK FROM COWS FED ON CONTAMINATED FORAGES. *Folia Vet. Lat., vol. 3:74-86, 1973. 16 refs.*

Lead toxicity is reviewed, and the history of the lead poisoning is described. Much of the lead pollution in soil is due to automobile exhaust. Two milk cows were fed forage with added lead acetate. The 20 kg of lead corresponded to 50 ppm, a level that is often found in hays near major highways. The cow s milk was then analyzed for lead content. During the first and second phase of administration of lead salts, the milk cows did not show any evident symptoms of intoxication. The lead in the milk did have a marked correlation with the administered lead. The lead doses did not last long enough for chronic symptoms to begin. The dosage of lead in milk, due to the facility of drawing samples and the relevant levels of response, could represent a valid method for diagnosing incipient chronic intoxications.

**41088** **APTIC NO. 64895**

Taniyama, T.

AIR POLLUTION--AGRICULTURE AND FORESTRY PLANTS DAMAGED BY SULFUR OXIDES. *(Taiki osen--tokuni iou sankabutsu ni yoru norinshokubutsu higai). Text in Japanese. Kogai to Nihon no Kagaku (Pollut. Jap. Sci.), no. 6:19-29, Sept. 1973. 14 refs.*

The principle pollutant emitted from oil and electric power plants is sulfur dioxide. The decline in crop production caused by SO2 pollution has been increasing year by year. The effects caused by SO2 gas can be divided into visible and invisible damages. Invisible damages affect photosynthesis and respiration.

**41089** **APTIC NO. 64824**

Watanabe, Junichiro and Shoji Amano

EFFECTS OF FOLIAR SPRAY OF MINERAL SOLUTIONS ON THE LEAF FALL, RECOVERY FROM FOLIAR CHLORISIS, AND FRUIT SET OF CONTAMINATED SATSUMA MANDARINS GROWN IN THE VICINITY OF AN ALUMINA-REFINING FACTORY. *(Arumina seiren kojo kinsetu onshu mikanen ni okeru kakushu enrui yoeki no yomen sanpu ga higaiju no rakuyoritsu ha no kuroroshisu kaifuku narabi ni kekkaritsu ni oyobosu eikyo). Text in Japanese. Ehime Daigaku Noagakbu Kiyo (Mem. Coll. Agric., Ehime Univ.), 18(1):143-155, Aug. 1973. 12 refs.*

Various chemical foliar sprays were tested for their efficacy in reducing fluorine damage to Satsuma mandarin fruit grown in the vicinity of an alumina refining factory. Foliar spray with lime exerted various desirable effects on the persistency of leaves, setting of fruit, titratable acidity of juice, and chlorophyll content of the leaves. Among the mineral elements in the leaves of the sprayed plants, only magnesium showed consistent changes with the application of various sprays.

**41090** **APTIC NO. 63337**

Kanagawa Prefectural Agricultural Experimental Test Station (Japan)

STUDIES OF THE EFFECTS OF AIR POLLUTION ON TREES AND ON GREEN TREE GROWTH. *(Taiki osen no jumoku ni oyobosu eikyo narabi ni ryokka jumoku ikusei ni kansuru kenkyu). Text in Japanese. In: The 1972 Investigation of Air and Water Pollution on the Human Health by the Chiba Prefectural Government Dept. of Hygiene. Rept. 15, p. 182-196, Feb. 1973.*

Trees in six parks and green areas in the Kawasaki area were investigated from the coastal area to inland, to see the effects of pollution on trees. Gingko trees and pasania were compared, and in all areas, gingko was free of insect damages, but pasania trees were damaged by several kinds of parasites. Generally, the sulfur oxides content in the leaves decreased as the distance from pollution sources increased. Generally the content ratio was higher in gingko, and in areas close to emission sources, the level of sulfur content was twice as high in gingko as in pasania. The farther away from emission sources, the greater was the growth rate for pasania, but a reverse tendency was noted for gingko. However, the size of the leaves were larger for gingko in areas farther away from emission sources. The relationship between the distance from emission sources and the degree of damages on pasania trees (discoloration of leaves, dead branches, and abnormal growth could not be grasped clearly, but pollution and parasite seemed to have some relationship. The soil s chemical composition, general appearance and growth, growth rates, leaf size, number of remaining leaves, extent of damages, state of insect damages, and sulfur content in leaves are presented in tables.

**41091** **APTIC NO. 64639**

Kanagawa Prefectural General Agricultural Research Inst.

THE EFFECTS OF AIR POLLUTANTS ON HORTICULTURAL AND AGRICULTURAL PRODUCE. *(Taiki osen busshitsu ga engei sakubutsu ni oyobosu eikyo). Text in Japanese. In: The 1972 Investigation of Air and Water Pollution on Human Health by the Chiba Prefectural Government Department of Hygiene. Rept. 15, p. 197-203, Feb. 1973.*

At 16 monitoring locations in Kanagawa prefecture, settling particles, sulfur oxides, nitrogen oxides, chlorine ion were measured in dust jars and by alkaline filter paper. The yearly average of dusts for the total prefecture is 5-6 tons/sq km/mo whereas in the Yotsuya district of Kawasaki, the yearly average reaches 22.7 tons/sq km/mo. The annual average of SOx is 1.8 mg/100 sq cm/day in Yotsuya in Kawasaki, 4 mg/100 sq cm/day in other districts in Kawaski, and in other cities, 0.2-0.3 mg. The NOx averages are relatively high in Kawasaki and central area of the prefecture, and 0.1 mg/100 sq cm/day in suburban cities. The level of Cl ions is relatively high west of the prefecture, and in all cases, an increase was noted between summer and fall, clearly infludenced by the sea breeze. As plant indicators, gingko and pine trees were selected and the leaves were sampled near 16 monitoring locations, and sulfur contents were analyzed. The trees were unhealthy and deformed in the industrial areas of Kawasaki, but in other areas, no extraordinary damages were noted. The sulfur content in gingko leaves was the highest in the Daishi district of Kawasaki and was more than 1%. In other areas, it ranged from 0.24 to 0.6%. The S content in pine trees was much smaller, ranging between 0.1 and 0.3% even in Yotsuya, Kawasaki. Fumigating experiments of various produce showed that an exposure to 2 ppm sulfur dioxide for 4 hrs changed the color of tea leaves and the leaves eventually dropped. Relatively visible damages appeared on eggplants, persimmons, grapes, and pears with an exposure of 1 ppm S02 for 3 hr, on tomatoes and tea with 2 ppm for 3-8 hrs, and lettuce, plums, oranges, and mulberry leaves were relatively strong.

**41092** **APTIC NO. 64778**

Kanagawa Prefecture (Japan), Secretariat of Countermeasures to Environmental Pollution

AN INTERIM REPORT ON THE INVESTIGATION OF THE EFFECTS OF AIR POLLUTION ON THE ECOLOGICAL SYSTEM OF INSECTS. *(Konchu seitaikei ni oyobosu taiki osen eikyo ni kansuro chosa kenkyu (chukan hokoku). Text in Japanese. 4p., Dec. 1973.*

To examine the effects of air pollution on the ecological system of insects, the kinds and number of insects caught by light traps set up at 23 points distributed in Kanagawa Prefecture were recorded on every 5th and 20th day of the 5-month period from May to Sept. 1973. The most numerous insects caught are moths, amounting to 9465 of about 400 species (almost most numerous in species), among less than 1000 species which exist in the Prefecture. The points where the number of species was the largest, relatively large, medium, relatively small, and small was, respectively, 3, 5, 5, 8 and 2. A method of establishing an index insect is now under discussion. The index of multiplicity of the specimen corresponds fairly well to the concentration of environmental aerial pollutants. Statistical methods for determining indexes of air pollution by biological indicators are given.

## 1972

**41093** **APTIC NO. 63037**

Biggs, R. H. and J. F. Bartholic

AGRONOMIC EFFECTS OF CLIMATIC CHANGE. *Dept. of Transportation, Cambridge, Mass., Transportation Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 394-403. 18 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

The possible effects on cultivated plants of an increase in ultraviolet (UV)-B radiation (280-315 nm) in the biosphere are described. The effects include UV damage to plant s cellular processes and their adaptive mechanisms for utilizing certain photochemical reactions while protecting themselves against damaging ones. The effects of temperature, precipitation, and weather patterns on crop yield in any given area are reveiwed. There is not enough data available to allow a reasonable prediction of plant responses to UV-B radiation particularly the interrelated responses in an ecosystem. (Author abstract modified)

**41094** **APTIC NO. 64860**

Bohne, Helmut

EXPLANATION OF A CASE OF FUME DAMAGE IN SCOTCH PINE STANDS IN THE RUHR. *(Klarung eines Rauchschadensfalles bei Kiefernbestanden im Ruhrgebiet). Text in German. Mitt. Forst. Bundesvers., no. 97:141-150, 1972. (Presented at the International Symposium of Forest Fume Damage Experts, 7th, Essen, West Germany, Sept. 7-11, 1970.)*

Sulfur dioxide emitted from coal-burning factories about 4 km to the south and southwest is responsible for the extremely poor appearance and stagnation in the diameter growth of pine stands in the center of the Ruhr. During the growing season, observations of the vegetation were made repeatedly in a wide circle around the works. These revealed trees and bushes which were completely dead or killed off on one side, asymmetrical growth of many plants, color changes in a wide range of plant species, and a progressive reduction in the frequency of these phenomena with increasing distance from the works in all directions. The symptoms of leaf injury were characteristically more pronounced on the side nearer the works, indicating the emission of fluoride compounds from one of the factories. The results of the chemical leaf analyses for sulfur and fluorine confirmed the visual observations with regard to toxic substances and pollution source. Fluorine contents of 24 mg% in leaves and 10 to 14 mg% in the pine needles were found. Measurements of the annual rings showed that diameter increments ceased completely after 1956, which was the year when pollutants were first emitted from the production of fertilizer. The greatest portion of the damage due to acid fumes was caused by pollutants containing fluorine; by comparison, the damage caused by SO2 was of lesser importance.

**41095** **APTIC NO. 64821**

Eda, Shizno, Hiroshi Hikichi, Hiroshi Itoh, and Yoshiichi Funayama

HEAVY METAL POLLUTION OF RICE AND VEGETABLES IN RELATION TO THE SOIL AND THE POLLUTION SOURCE. *(Sanmai no jukinzoku osen to dojo oyobi osengen to no sokansei ni tsuite). Text in Japanese. Fukushima Kogyo Koto Senmon Gakko Kiyo (Mem. Fukushima Tech. Coll.), 8(1):90-97, 1972. 13 refs.*

Atomic absorption spectrometry was used to measure the amount of heavy metals in rice and other vegetables in an investigation of the relationship of vegetable metal content to metal pollution of the soil and the pollution source. Heavy metal concentrations generally increased in rice with increasing amounts in the soil. Maximums of 3, 6, and 35 ppm were obtained for cadmium, copper, and zinc, respectively, in rice. The relation of heavy metal pollution source showed the same tendency as metal pollution of the soil with respect to the source.

**41096** **APTIC NO. 63094**

Evans, Lance S. and Paul R. Miller

COMPARATIVE NEEDLE ANATOMY AND RELATIVE OZONE SENSITIVITY OF FOUR PINE SPECIES. *Can. J. Botany, vol. 50:1067-1071, 1972. 6 refs.*

Relative ozone sensitivity was evaluated according to morphological and histological characteristics in four pine species grown in containers under greenhouse conditions in California s San Bernardino National Forest. The secondary leaves of the more ozone-sensitive species exhibited a larger number of stomata per cross-sectional area of mesophyll cells, while the number of mesophyll cells per stomata was lower. The number of hypodermal layers and thickness of the epidermal and hypodermal layers was negatively correlated with ozone sensitivity. In more ozone- tolerant pine species, initial injury was more closely associated with substomatal mesophyll cells. Ozone injury affected a greater proportion of the entire needle of the sensitive species as evidenced by histological symptoms closer to the needle base. (Author abstract)

**41097** **APTIC NO. 64555**

Hutchinson, T. C.

THE OCCURRENCE OF LEAD, CADMIUM, NICKEL, VANADIUM, AND CHLORIDE IN SOILS AND VEGETATION OF TORONTO IN RELATION TO TRAFFIC DENSITY. *Toronto Univ. (Ontario), Dept. of Botany and Toronto Univ. (Ontario), Inst. for Environmental Studies, Pub-EH-2, 28p., June 1972. (Presented at the Ontario Association of Professional Engineers, International Automobile Pollution Conference, Toronto, Ontario, June 1972.)*

During June to August 1970, soil and plant samples were taken at eight sites around Metropolitan Toronto with a wide range of traffic density and degree of urbanization. At each of the sites, three replicate profiles were excavated, cleaned and depth samples taken, and vegetation collected. Total metallic content, lead, cadmium, nickel, and vanadium were measured by atomic absorption spectrophotometry. The toxicity of particular metallic salts was determined using root elongation as a bioassay technique. Radish and tomato seeds were an excellent material for these studies. Chloride levels were also measured, and were up to 1600 ppm in surface soils. A distinct soil profile effect occurred. High levels of lead occurred in both soils and vegetation in downtown Toronto. Concentrations of lead decreased with distance from traffic and had a soil profile distribution characteristic of an airborne source. Cadmium had a similar distribution at lower levels. Lead and cadmium in the soils were inhibitory to plant growth. Lead and cadmium levels in herbarium material from downtown Toronto increased several fold over the past 100 years. Vanadium and nickel increased in surface soils, with the lowest concentrations at the rural site. Nickel correlated with distance from the highway. Chloride levels near the edge of busy streets were high in midsummer, long after the cessation of the winter salting program. Spray carried fine particles away from the road. Soil levels were inhibitory to many plant species and to trees.

**41098** **APTIC NO. 63035**

Knipling, Edward B.

ULTRAVIOLET RADIATION AND PHOTOSYNTHESIS. *Dept. of Transportation, Cambridge, Mass., Transportation*

*Systems Center, Proc. Conf. Clim. Impact Assess. Program, 2nd, Cambridge, Mass., 1972, DOT-TSC-OST-73-4, p. 379-385. 18 refs. (Nov. 14-17.) (Available from the National Technical Information Service.)*

The adverse effects of ultraviolet (UV) radiation on photosynthesis are reviewed because stratospheric flights of supersonic transport aircraft may increase the flux of UV radiation reaching the earth s surface. The UV radiation damages biological systems primarily through destruction of specific cellular constituents rather than alteration of broad physiological processes. Photosynthesis is affected soon after absorption of UV radiation because of its general dependence on cellular integrity and specific dependence on UV vulnerable enzymes and other proteins. Most of the research on UV effects on photosynthesis has been conducted with high intensity radiation at 254 nm, which is shorter than the waveband of concern, 280 to 320 nm. Limited data from the unnaturally high intensities of this waveband indicate a small reduction in photosynthesis of single cell algae. (Author abstract modified)

**41099** **APTIC NO. 64579**

LeBlanc, Fabius, Dhruva N. Rao, and Gilberte Comeau

THE EPIPHYTIC VEGETATION OF POPULUS BALSAMIFERA AND ITS SIGNIFICANCE AS AN AIR POLLUTION INDICATOR IN SUDBURY, ONTARIO. *Can. J. Botany, vol. 50:519-528, 1972. 19 refs.*

Indices of atmospheric purity (IAP) of 31 sites selected in sulfur dioxide-polluted as well as in non-polluted areas around Sudbury, Ontario were determined on the basis of number, frequency-coverage, and resistance factor of the epiphytes of Populus balsamifera. The investigated area was delimited into 5 different IAP zones based on these indices, arranged into convenient ranges. The zones were then compared with SO2 pollution zones based on ground-level average concentration of the gas prevailing in the area, and the comparison indicated that the biological method provides a valid, quick, and economical method for assessing and mapping the long-range effect of pollution for a given area. (Author abstract modified)

## 1971

**41100** **APTIC NO. 62903**

Jones, L. H. P.

FORM AND AVAILABILITY OF MINERAL NUTRIENTS IN THE SOIL. *In: Grassland Research Inst. Annual Report 1971. Grassland Research Inst., Maidenhead (England), p. 17-21, 1971.*

Several studies of the form and availability of mineral nutrients in the soil and of the uptake and utilization of mineral nutrients by plants are reviewed. Investigations reviewed concern how much potassium should be applied as a fertilizer to soils to ensure an adequate supply for forage plants, the availability of nonexchangeable potassium to grass, the availability of sulfur to herbage species such as ryegrass, the chemical form and availability of iodine in soils, the availability of trace elements to herbage species such as ryegrass, the uptake of iodine by different herbage species, and the uptake and utilization of nitrogen and sulfur by grass.

**41101** **APTIC NO. 64588**

Poovaiah, B. W. and H. H. Wiebe

EFFECTS OF GASEOUS HYDROGEN FLUORIDE ON OXIDATIVE ENZYMES OF PELARGONIUM ZONALE LEAVES. *Phytopathology, vol. 61:1277-1279, 1971. 7 refs.*

Changes in peroxidase and cytochrome oxidase enzymes were established histochemically in hydrogen fluoride fumigated leaves of Pelargonium zonale. Highest peroxidase and cytochrome oxidase activites were localized near the injured areas of fumigated leaves and showed an enhanced benzidine blue coloration in the phloem, with a decreased color or its complete absence in the palisade parenchyma. The enzyme activity was clearly evident in the phloem even after surrounding mesophyll cells had collapsed. Parallel experiments conducted on leaves infiltrated with sodium fluoride solutions showed similar results, though peroxidase activity was inhibited by fluoride levels higher than 0.01 M for 6 hr of bathing. (Author abstract modified)

## 1969

**41102** **APTIC NO. 63108**

Cantwell, Allan Michael

AIR POLLUTION IN DELAWARE AND ITS EFFECT ON PLANTS UNDER AMBIENT AND CONTROLLED ENVIRONMENTAL CONDITIONS. *Delaware Univ., Newark, Dept. of Plant Pathology, Thesis (M.S.), June 1969, 92p. 78 refs.*

Air pollution investigations in Delaware identified the major plant toxic pollutants as ozone and sulfur dioxide, both contaminants undergoing a yearly cycle. Daily cycles were also observed for the pollutants. Climatic conditions correlated with high pollution levels; and highest ozone levels occurred on days of high temperature, high barometric pressure, and little sky cover. Greenhouse tests proved that present ambient levels of ozone and SO2 are causing damage to sensitive plants. Low levels of the growth regulant Algar reduced damage from ozone on lima bean to negligible amount in laboratory tests. Plants were sensitized toward ozone by treatment with an iodide-bromide solution; such a procedure appeared useful as an ideal biological indicator of air pollution since the sensitized plants responded to the lowest levels of ozone detectable on conventional electro-chemical analyzers. (Author summary modified)

**41103** **APTIC NO. 63056**

Sinclair, Michael Gervase

THE EFFECTS OF OZONE ON TWO VARIETIES OF TOBACCO POLLEN AND ON THE CONIDIA OF THE FUNGUS MONILINIA FRUCTICOLA. *Delaware Univ., Dept. of Plant Pathology, Thesis (M.S.), June 1969, 64p. 63 refs.*

Tobacco plants have been widely used as biological indicators of ozone. The variety Bel W-3 is extremely susceptible to ambient levels of O3 (1-15 pphm), whereas the variety Bel B is resistant at these concentrations. Experiments were performed to determine whether the pollen of these two varieties exhibited the same response. Similar tests were also conducted on the macroconidia of the fungus causing brown rot of stone fruits. The O3 analysis was done with 1% potassium iodide dissolved in a neutral buffer consisting of 0.1 M disodium hydrogen phosphate and 0.1 M potassium dihydrogen phosphate. The O3 liberated iodine from the iodide solution and the absorbance was determined in a spectrophotometer at 352 millimicron. The pollen grains were cultured at a temperature of 30 C in a medium of 21% sucrose and 91 ppm boron. The macroconidia of Monilinia fructicola were incubated at 25 C in a medium of 0.01 M succinic acid and 0.01 citric acid in a 0.1 M phosphate buffer. With the system as described, O3 at ambient levels appeared to have little effect on the macroconidia or on the pollen of Bel W-3 and Bel B. At higher concentrations, the O3 stimulated the percentage of germination and the growth of the macroconidia and the pollen grains of both varieties.

## 1967

**41104** **APTIC NO. 60559**

Treshow, Michael, Gerald Dean, and Frances M. Harner

STIMULATION OF TOBACCO MOSAIC VIRUS-INDUCED LESIONS ON BEAN BY FLUORIDE. *Phytopathology, vol. 56:756-758, 1967. 4 refs.*

The possible effect of fluoride on the number of local lesions developing on Pinto bean leaves following inoculation with tobacco mosaic virus was studied. Plants were grown in fumigation chambers in which atmospheric fluoride concentrations ranged from 0.2 to 2.5 micrograms/cu m; foliar fluoride concentrations ranged from 20 to 637 ppm. The number of lesions increased with foliar fluoride concentrations up to 500 ppm, above which the number decreased. Since the number of lesions that developed varied among fumigations, the lesion numbers were converted to percentages of the control. Lesion numbers on plants in the unfumigated chamber served as a control, and these values represented 100%. The numbers of lesions on the leaves with fluoride concentrations of 100-200, 200-300, and 300-500 ppm were 121, 157, and 179% of the control, respectively. The correlation coefficient of 0.802 between fluoride concentrations up to 300 ppm and lesion numbers was significant at the 1% level. When lesion numbers were grouped according to leaf age, irrespective of fluoride concentration, lesions were most prevalent on the first trifoliolate leaves. The number of lesions diminished on the older leaves and on older plants. When leaves are fully developed and plants reached the four- to five-leaf stage, no lesions could be induced. (Author abstract)

### 1964

**41105** **APTIC NO. 60913**

Materna, Jan

WAYS OF DETERMINING DAMAGES TO FOREST STANDS CAUSED BY INDUSTRIAL AIR POLLUTION. *(Moznosti prukazu skod pushobenych prumyslovymi exhalaty v lesnich porostech). Text in Czech. Les Pr., 43(5):212-216, May 1964.*

Solid pollutants affect trees indirectly, mainly by adhering to the leaves and thus depriving them of the benefits of the sunlight. They are, however, less injurious than the gaseous pollutants. The worst offender among these is sulfur dioxide because it is so wide-spread; the effects of chlorides and fluorides are equally as bad, although these elements do not occur as frequently in the atmosphere. Nitrogen oxides are injurious only in the immediate vicinity of the source. Conifers are seriously affected by sulfur dioxide; their needles are discolored, become dry and drop off. Older growth is affected first. Spruce shows serious damage after prolonged exposure to as little as 0.5 mg silicon dioxide/cy m air. Fir and larch are also very sensitive; pine is less sensitive. Broad-leaved trees are far more resistant to high pollutant concentrations which cause necrosis on the periphery of the leaf and gradually extend to the interior under prolonged attack. Diagnostic methods include determination of the pollutant concentration in the foliage and in the soil. An important factor is the chlorophyll content; SO2 reduces its overall content, and changes the ratio a:b chlorophyll. The affected foliage contains also pheophytin, which is formed by magnesium abstraction from chlorophyll. In the case of conifers, a quantitative diagnostic tool is the Haertel test (hot water extraction of the needles, measuring of the turbidity of the extract). Another simple test is the sun test in which twigs are cut off and exposed to sunlight. Twigs from trees affected by SO2 dry much faster than twigs from healthy trees.

## EFFECTS-MATERIALS

### 1974

**41106** **APTIC NO. 63139**

Arndt, Uwe and Ute Gross

LONG TERM IMMISSION EFFECTS ON UNPROTECTED WOOD. *(Langfristige Immissionswirkungen an ungeschuetztem Natzholz). Text in German. Staub, Reinhaltung Luft, 34(6):225-227, June 1974. 9 refs.*

Field experiments to determine air pollution effects on unprotected wood were carried out over a 1-year period in four different locations in North Rhine-Westphalia (the municipal power plant in Duisburg, Essen, Herten, and Burgsteinfurt). Pieces of Pinus sylvestris and Afzelia bipidensis were exposed on a rack with 45 deg inclination facing southwest. Weight and color modifications in the test samples and accumulation of pollutants in the outer layers of the wood served as indicators. Dust fall, sulfur dioxide, and fluorine were measured. Dusts and gaseous pollutants have a significant effect on unprotected wood.

**41107** **APTIC NO. 62921**

Gerhard, Jon and Fred H. Haynie

AIR POLLUTION EFFECTS ON CATASTROPHIC FAILURE OF METALS. *Environmental Protection Agency, Research Triangle Park, N. C., Chemistry and Physics Lab., Proj. 21 AMN, Program Element 1AA008, 36p., April 10, 1974. 18 refs.*

Air pollutants contribute to the catastrophic failure of metal structures through the mechanisms of stress-corrosion cracking, corrosion fatigue, and hydrogen embrittlement. These mechanisms and examples of failures are reviewed. The Silver Bridge catastrophe, Loran tower parts failures, aircraft parts failures resulting in accidents, and communications equipment failures are the examples cited that were related to air pollution. An economic analysis of these failures indicated that accompanying loss of life and injury causes $50-100 million annual economic loss to the nation. Unfortunately, there has been no research to determine the the exact relationships between air pollution levels and specific and specific air pollutants and occurrences of catastrophic failures of metals. (Author abstract modified)

**41108** **APTIC NO. 63216**

Jellinek, H. H. G., F. Martin, and H. Wegener

TENSILE STRENGTH OF POLYURETHANE EXPOSED TO NITROGEN DIOXIDE. *J. Appl. Polymer Sci., 18(6):1773-1778, June 1974. 3 refs.*

Polyurethane prepared from tetramethylene glycol and diisocynate was exposed in the form of films to small pressures of nitrogen dioxide and NO2 plus air. Tensile strength was measured as a function of exposure time and temperature (-22 C to +22 C) with an apparatus especially constructed for the purpose of measuring mechanical properties in different environmental atmospheres. Tensile strength decreased with exposure time and passed through maxima near 10 C as a function of temperature for definite exposure times. The rate of decrease in tensile strength in the presence of NO2 plus air was appreciably larger than in NO2 alone. (Author abstract modified)

**41109** **APTIC NO. 63171**

Sakai, Kiyoko and Harumi Hisada

ON THE INFLUENCE OF ATMOSPHERIC POLLUTION MAKING CLOTHES DIRTY. *(Taiki osen ga ifuku no yogore ni oyobosu eikyo ni tsuite). Text in Japanese. Nagoya Joshi Daigaku Kiyo (Bull. Nagoya Womens Coll.), no. 19:211-217, March 1974. 2 refs.*

The effects of air pollution on clothing were investigated by a questionnaire given to 200 residents of polluted area of Yokkaichi, 200 residents of relatively unpolluted area of Nagoya, and 50 residents of the lead polluted area in Nagoya. The questions included the condition of the environment, whether the environment affected the degree of soiling of clothes, the time of soiling, the type of soiling, and the effects of the air on clothes dried out of doors. The results showed that the degree of soiling of clothes differed greatly depending on the environment. More than 65.4% of residents of the polluted area answered that the environment soiled their clothing. In the least polluted area of Nagoya, 97.4% answered that pollution had no effects on their clothing. In the polluted area, 55.3% answered that clothing was affected most in summer, and 16.7% answered that it was winter. It seemed to be related with the direction of predominant winds. In the polluted area, most people felt that soot was the main cause for soiling of their clothing. In the polluted area, 86.0% answered that hanging clothes out of doors caused the soiling, and 10.3% answered it did not affect the clothes. In the least polluted area, 94.9% answered that drying clothes out of doors had no effects on the clothes.

## 1973

**41110** **APTIC NO. 64587**

Rahmel, A.

KINETIC CONDITIONS FOR THE SIMULTANEOUS FORMATION OF OXIDE AND SULPHIDE IN REACTIONS OF IRON WITH GASES CONTAINING SULPHUR AND OXYGEN OR THEIR COMPOUNDS. *Corrosion Sci., 13(2):125-136, Feb. 1973. 25 refs.*

Kinetic conditions and the scaling of pure iron is investigated in nitrogen-oxygen-sulfur dioxide and carbon monoxide-carbon dioxide-carbonyl sulfide mixtures between 700 and 900 C. Simultaneous formation of iron oxide an/d iron sulfide at the scale/gas phase boundary is observed when the diffusion in the aerodynamic boundary layer or the reaction at the scale/gas phase boundary is the rate-controlling step of the oxidation in the O2-N2 mixtures or of the sulfidation in CO-COS mixtures. The addition of the second oxidant (SO2 to O2-N2 mixtures and an incresed CO2 to CO-CO2-COS mixtures) increases the rate of the oxidation or sulfidation reactions. When the diffusion of iron ions and electrons through the oxide or sulfide layer respectively, or the reaction at the metal/scale phase boundary are rate-determining, the thermodynamically stable phase (oxide or sulfide) is formed exclusively and the addition of the second oxidant has no influence on scaling rate. The results may be understood from an evaluation of the equilibria prevailing at the scale/gas phase boundary. (Author abstract modified)

## 1972

**41111** **APTIC NO. 64586**

Sydberger, T. and N.-G. Vannerberg

THE INFLUENCE OF THE RELATIVE HUMIDITY AND CORROSION PRODUCTS ON THE ADSORPTION OF SULFUR DIOXIDE ON METAL SURFACES. *Corrosion Sci., 12(10):775-784, Oct. 1972. 12 refs.*

The influence of the relative humidity and corrosion products on the adsorption of sulfur dioxide on metal surfaces was studied by using a sulfur-35 isotope of SO2 at relative humidities of between 50 and 98%. Adsorption properties of polished iron, zinc, copper, and aluminum samples were compared with those of pre-exposed samples of the metals. Measurements showed a pronounced dependence of the adsorption rate on the humidity, with almost quantitative adsorption of SO2 on pre-exposed Fe samples at relative humidities equal to or greater than 80%. Remarkably low adsorption capacities at humidities less than 90% were found for the corrosion products of Cu and Al. The corrosion sensitivity of different metals towards SO2-polluted atmospheres is related to the adsorbability of SO2 on the metal surfaces. (Author abstract modified)

# EFFECTS-ECONOMIC

## 1974

**41112** **APTIC NO. 63298**

Detrie, J. -P.

ECONOMY AND AIR POLLUTION. *(Economie et pollution atmospherique). Text in French. Pollut. Atmos. (Paris), 16(61):1-16, Jan.-March 1974.*

The costs and economic impacts of air pollution abatement in energy generation, domestic heating, and industries in France are surveyed. Particulate emissions from combustion processes can be abated without excessive expenses while the costs of sulfur dioxide emission control will be dependent mainly of the availability of fuels with low sulfur contents and the costs of fuel desulfurization. The increasing fuel prices will lead indirectly to reduced fuel consumption and consequently to reduced pollutant emissions. The overall air pollution control-related investment by the French industry is expected to rise from $60,000,000 in 1970 to $100,000,000-120,000,000 in 1975. The investments for air pollution control vary greatly from 2 to 3% for thermal power plants and petroleum refineries up to 25% for foundries. The product prices will be increased 0.8% for electricity, 11% for cement, and 13% for gypsum.

**41113** **APTIC NO. 63330**

Ferrar, Terry A. and Robert L. Horst

EFFLUENT CHARGES--A PRICE ON POLLUTION. *Atmos. Environ., vol. 8:657-667, June 1974. 6 refs.*

There has recently been a great deal of discussion relating to the concept of putting a price on pollution as a means of inducing control of environmental deterioration. The theoretical advantages offered by an effluent charge strategy are described by reviewing some of the arguments presented so vigorously by economists for the adoption of a national tax policy. The general concept of an effluent charge is discussed. The efficient allocation of resources in an idealized, perfectly competitive economy with a subsequent generalization to imperfect markets is also discussed theoretically. The least-cost to society attribute of an effluent charge scheme is examined. (Author abstract modified)

**41114** **APTIC NO. 63238**

Fleming, R. N. and R. H. Pantell

THE CONFLICT BETWEEN CONSUMPTION AND POLLUTION. *IEEE Inst. Elec. Electron. Engrs. Syst., Man, Cybern., SME-4(2):204-208, March 1974. 5 refs.*

A technical relationship between economic consumption and environmental pollution is defined which, in conjunction with a utility function, determines the manner in which consumption should vary with time so as to maximize utility. It is assumed that a specified pollution level is to be achieved at the termination of a given planning period, and the problem is to obtain the optimum path to this objective. A steady-state solution is obtained, as a special case, which specifies the most desirable constant levels of consumption and pollution. Critical parameters that enter into this solution are the discount (or appreciation) rate for the future, the decay lifetime for the pollutant, and the rate of change of pollution generation with respect to consumption. A closed-form solution is obtained for the low pollution case which indicates that the optimum consumption function decreases with increasing time. Computer solutions are given for the general case with several different values of critical parameters. (Author abstract modified)

**41115** **APTIC NO. 64453**

Gamse, R. N. and J. Speyer

ECONOMIC IMPACT OF SULFUR DIOXIDE POLLUTION CONTROLS. *Chem. Eng. Progr., 70(6):45-48, June 1974.*

Although environmental protection is attainable without unwarranted economic costs, the impact of each decision - economic and environmental - must be faced. Compliance with sulfur dioxide emissions regulations will be quite costly, with incremental costs for low-sulfur fuels or control technology in some cases equalling or even exceeding current fuel costs. But the economic impact of these regulations on the affected industries is not expected to be severe. Price increases directly attributable to pollution controls will be about 2% by 1975 and another 1-1.5% by 1978. Between 200 and 300 plant shutdowns affecting between 50 and 150 communities may be attributable to the regulations from 1970 to 1980. The Clean Air Act Amendments of 1970, the Environmental Protection Agency Clean Fuels Policy, and State Implementation Plans are reviewed with respect to sulfur dioxide pollution controls. Capital costs of stack gas scrubbers are $40-50/kW for new systems and $65-100/kW for retrofit scrubbers. Counting capital and operating costs, scrubbers add about $5-6/ton of coal for new systems and $7/ton for retrofits. Low-sulfur coals cost close to $6/ton more than high-sulfur coal. Tall stacks and intermittent control systems can alternatively be used to control SO2 by increasing dispersion. There appears to be enough low-sulfur coal and fuel oil to meet primary standards in 1975. By 1977, increased fuel desulfurization will enable standards to be met. But there will be a trade off between environmental quality and costs.

**41116** **APTIC NO. 64924**

Leavitt, Jack M., Henry F. Leckenby, John P. Blackwell, and Thomas L. Montgomery

COST ANALYSIS FOR DEVELOPMENT AND IMPLEMENTATION OF A METEOROLOGICALLY SCHEDULED SO2 EMISSION LIMITATION PROGRAM FOR USE BY POWER PLANTS IN MEETING AMBIENT AIR QUALITY SO2 STANDARDS. *Environ. Letters, 7(2):135-144, 1974. 2 refs.*

A cost analysis was prepared for the development and implementation of a meteorological-oriented program, applicable to large power plants, for limiting sulfur dioxide stack emissions during adverse atmospheric dispersion conditions. The analysis is based in part on the Tennessee Valley Authority s experience with the Paradise Steam Plant SO2 emission limitation program. The program enabled SO2 to be reduced to meet ambient air quality standards during critical meteorological conditions. This may be achieved by reduction in power generation and/or by use of low- sulfur fuel. The cost analysis is only for those program elements involved with the development and implementation of this type of emission limitation program and does not include costs incurred by the plant operator for power makeup, load interruption, or need for increased power reserved. The cost analysis first includes costs for the program development elements during the first year: air monitoring, field studies, and field data processing and analysis and program design. Then annual recurring costs for the program implementation following completion of the development phase are determined. Total monitoring costs are $84,400 for SO2 monitoring, $23,200 for meteorological monitoring, $67,000 for staff, data handling, and additional costs. Total costs for field studies are $114,700. Total costs for data processing and analysis and program design are $317,100. Annual operating costs for program implementation costs would be $101,000.

**41117** **APTIC NO. 64449**

ACTIVATED CARBON HEADS FOR SELL-OUT YEAR. *Chem. Eng. News, 52(29):7, July 22, 1974.*

Activated carbon is increasingly being used to control air and water pollution, such as recovery of fuel tank emissions in cars and control of emissions of vinyl chloride. Thus, markets for activated carbon may be more active than government figures reflect, since the figures show little or no growth in the largest traditional uses of activated carbon. Annual production of activated carbon is now more than 200 million pounds and is growing steadily. The 15-20% of the market not covered in government figures involves vapor-phase applications, largely the province of granular activated carbon, a fast-rising substitute for the traditional powdered product. Sales of granular activated carbon are growing by 10% a year and now account for a bit under half the total activated carbon market. Production of powdered activated carbon is declining however. Although activated carbon output has changed little in the past decade, new plants are being built and new techniques of manufacturing activated carbon are being developed.

**41118** **APTIC NO. 64631**

Federal Power Commission, Washington, D. C., Bureau of Power

STAFF REPORT ON POTENTIAL EFFECTS OF AIR QUALITY REGULATIONS ON THE BULK ELECTRIC POWER SUPPLY. *29p., Feb. 25, 1974.*

The nation s electric power supply reserves will be critically deficient in seven of the nine electric reliability areas if there is a continued insistence on strict adherence to existing air quality standards. If such standards are rigidly enforced, many steam electric power plants could be ordered to shut down. If this occurs, reserves for the entire U. S. would decline from 24.9% to 7.4% in 1975 and from 23.1% to 13.8% in 1977. These are unacceptable levels from the standpoint of reliability of service. Needed levels of installed reserves usually range from 15 to 25%. Specific analyses for the years 1975 and 1977 are presented. The largest amounts of capacity not in compliance with air quality regulations, and therefore potentially unavailable to supply load, are in the regions represented by the East Central Area Reliability Coordination Agreement, the Southeastern Electric Reliability Council, and the Mid-America Interpool Network, which together cover about a third of the country and provide for 44.3% of the capacity and 44.9% of the peak load in 1975 and 1977. Flue gas desulfurization facilities are neither available in the quantity needed, nor do they have a reliability compatible with operating steam electric plants. Even when emission control systems of demonstrated reliability become available, considerable time will be required to retrofit existing electric plants. Supplemental control systems are viable near-term alternative which would permit air quality to be maintained during various atmospheric conditions while conserving the fuel supply. Tables are presented on the effects of air quality emission standards on power supply through the nation, indifferent areas, and by state. Source emission limits for fossil-fueled electric generating plants are listed by state.

## 1973

**41119** **APTIC NO. 63055**

Burnham, J. B.

TOMORROW S ENVIRONMENTAL BENEFIT/COST ANALYSIS. *Battelle Memorial Inst., Pacific Northwest Lab., Atomic Energy Commission Contract, 18p., 1973. 10 refs. (Presented at Oregon State University, Corvallis, Oreg., May 17, 1973.)*

NTIS: BNWL-SA-4722

Methods under development for the measurement of environmental effects, for evaluating the community s value judgments on these criteria, and for combining them into a useful decision tool using cost-benefit analysis are discussed. The criteria selected for the analysis were aesthetic impact, land use, economic, water impact, air impact, cultural, health and safety, and ecological impacts. These criteria and the evaluation matrix for the combined social and technical analysis are discussed. The management of risks requires use of criteria of risks and objective decisions. The benefit/risk pattern for involuntary exposure to pollution is discussed. Several examples regarding radiation risks are described.

**41120** **APTIC NO. 63306**

Field, Stanford

THE U.S. ENERGY PUZZLE. *Proc. Am. Petrol. Inst., Div. Refining, vol. 53:812-840, 1973.*

As the GNP (Gross National Product) has increased and the standard of living increased, use of energy increased in the U. S. However, there is now an energy shortage which may affect pollution prevention programs. In 1970, the U. S. energy balance was supplied primarily from domestic sources (90%). Petroleum accounted for 43% of the energy supply, domestic oil provided 77% of that portion. Natural gas accounted for 32%, and coal supplied 19%. The supply of various fuels, fuel and energy demands, and the GNP/energy relationship are discussed. Total energy demand has increased from 9.2 MM bpcd in 1920 to 33.5 in 1970. Per capita GNP has increased from $1410 to $3550. Future GNP will increase at a real growth rate of 4.2%/yr through 1985. The demand for primary energy resources for power generation will be affected by laws to reduce pollution. Nuclear plants will increase, scrubbing or other methods will reduce sulfur dioxide emissions, and low-sulfur coal and other fuels will be increasingly demanded. Gasoline demand will continue to depend primarily on automobiles. It is expected to increase from 5.8 MM bpcd in 1970 to 11 MM bpcd in 1985. Decreased car weight, use of unleaded gasoline, and emission control methods will counteract each other on their effects on fuel economy. The increased demand for natural gas coupled with decreased supply has resulted in a chaotic situation. Although current world petroleum demand is about 18 billion barrels/yr, the world reserves are 600 billion barrels, which would lead to severe depletion in the next 10-15 years. Domestic refinery construction in the U. S. has come to a halt, and refineries being built in the Caribbean and other offshore locations can only be used in a limited way. Thus, future increased demand for refined products may not be met. Similarly, gasoline supply may be short of potential demand by 1.2 MM bpcd by 1985. Future fuel costs, the 1985 energy balance, future GNP, and recommendations to lesson the impact of a coming energy shortage are also discussed.

**41121** **APTIC NO. 63107**

Miedema, A. K., C. E. Decker, F. Smith, and J. White

COST OF MONITORING AIR QUALITY IN THE UNITED STATES. *Research Triangle Inst., Research Triangle Park, N. C., Environmental Protection Agency Contract 68-02-1096, Task 3, Program Element 2AH137, Rept. EPA-450/3-74-029, 93p., Dec. 1973. 15 refs.*

Two sets of aggregate national air quality monitoring costs are estimated. The first set projects the costs of implementing the minimum federal air quality surveillance requirements, and $3.2 million incremented capital is estimated as necessary to complement existing instruments if such a network is to become operative in 1974. The annualized cost to operate the network is estimated at $12.8 million. The second set projects costs of implementing the state-proposed networks. An incremental capital cost for instruments is estimated to be $12.6 million to complement existing networks, with an annualized cost of operating the proposed networks at $36.9 million. Analysis of portable and automated air quality monitoring stations indicates that telemetric stations are less costly than logging systems. An extensive table of costs is included for each state.

**41122** **APTIC NO. 64729**

Unzelman, G. H., G. W. Michalski, and A. F. Lovell

CAN THE U. S. AFFORD THE CRUDE OIL PENALTY? *Proc. Am. Petrol. Inst., Div. Refining, vol. 53:768-802, 1973. 10 refs.*

By modifying 1976 Federal automotive emission standards to the general range of proposed California standards, more than a million extra barrels of oil/day would be available by 1980, increasing to 2.3 million barrels/day by 1985. This is because the more-severe Federal standards will demand the application of questionable catalytic systems that require unleaded gasoline that has lower octane quality and thus causes reduced engine efficiency and greater fuel consumption. The 1976 Federal standards call for 0.41 g/mi hydrocarbons, 3.4 g/mi carbon monoxide, and 0.4 g/m nitrogen oxides, a 96.2% reduction. The 1975 California standards give 0.9, 17.3, and 1.5 g/mi and 82.3%, respectively. The 2.3 million barrels of crude oil/day that can be saved by modifying the 1976 Federal emission standard is based on a continuation of the present standard of living. By projecting gasoline use to 1985, it is obvious that larger amounts of crude oil will be consumed by the 1976 standards unless they are modified It will be difficult to replace the fuel oil used to meet the standard because of various economic factors such as the supply of oil in the U. S. and the factors influencing the import of oil. Another consideration in modifying the standards is that catalytic mufflers may not really be practical. Strict quality control will be needed for the new catalysts, durability problems and poisoning problems have not been totally solved, and overheating may cause catalyst deterioration. The thermal reactor is a noncatalytic device that offers a high degree of emission control and is not sensitive to lead compounds. Such a device might be better in the long run than catalytic reactors. The crude oil penalty for catalytic systems to meet 1976 Federal standards is 9-10% of the crude run in 1985. Regardless of its size, any unnecessary crude oil penalty is unthinkable in the face of the U. S. energy shortage.

### 1972

**41123** **APTIC NO. 60734**

Lo, Fu-chen and Kathryn Mason

THE OAP REGIONAL ECONOMETRIC MODEL: A REVISED VERSION. VOLUME 2: USERS MANUAL. FINAL REPORT. *CONSAD Research Corp., Pittsburgh, Pa., Office of Air Programs Contract 68-04-0039, Rept. APTD-1456, 150p., Sept. 25, 1972. 5 refs.*

A revised users guide of the OAP (Office of Air Programs) Regional Econometric Model is presented to facilitate an efficient simulation of various control strategies. Topics covered include: job deck set-up, data input deck, and program deck description for Program RMS (Regional Model Simulation), Program IOA (Input-Output Analysis), and Program FBE (Feedback Effects). An appendix includes Environmental Protection Agency cost estimates. Air pollution control strategies are first transformed into a set of appropriate model inputs; the computer program then accepts these inputs as exogenous shocks to the model system and generates as output measurements of the changes in the key economic variables in the Air Quality Regions under study.

## STANDARDS AND CRITERIA

### 1974

**41124** **APTIC NO. 63150**

Fujiwara, Masahiro

THE BASIC THINKING FOR THE TOTAL EMISSION QUANTITY REGULATIONS FOR AIR POLLUTION. *(Taiki osen no soryo kisei no kihonteki kangaekata). Text in Japanese. Kogai to Taisaku (J. Pollution Control), 10(6):51-56, June 1974.*

In view of the inadequacy of the existing regulatory system, the establishment of total emission quantity regulations is necessitated. Total emission quantity regulation is defined as the total permissible emission quantity of pollutant to maintain environmental standards in a given region determined by highly scientific procedures taking the regional characteristics into account. The regulatory standard for each industrial unit is determined to maintain the total emission quantity at or below the standard level. The merits and shortcomings of the total emission quantity regulation are discussed. The term environmental capacity, which is one of the criteria for determining the total emission quantity regulation, is defined. The total emission quantity is calculated based on a simulation model including meteorological factors, emission height, emission quantity, and geographical factors. The methods of determining regulatory standards for each industrial unit are also described.

**41125** **APTIC NO. 64439**

Kato, Keiji

SETTING OF NEW EMISSION STANDARDS FOR SULFUR OXIDES. *(Io sankabutsu no shin haishutsu kijun no settei ni tsuite). Text in Japanese. Denki Kyokai Zasshi (J. Japan Elec. Assoc.), no. 606:21-27, April 1974.*

The February 1967 maximum allowable standards for sulfur oxides were made more stringent in May 1974. The methods of enforcement of these standards, the calculation method for emission by caloric (K) values, general and special standards for various localities, and revised prefectural ordinance addenda are discussed. The relationship between the K figures and the maximum ground concentration are, by the new standards, 1.17 to 0.002 ppm, and 3.50 to 0.006 ppm, with a maximum of 17.5 to 0.030 ppm. The general emission standards will be enforced by June 30, 1974, and control measures by fuel changes and installation of control devices must be taken before that date. For sintering furnaces for which the stack height cannot be increased due to the aeronautical regulations, a two year extention will be given for the installation of a desulfurization system or taking steps toward fuel changes. December 31, 1975 is given as the deadline for the facilities in the process of installing desulfurization systems.

**41126** **APTIC NO. 63149**

Quarles, John

SOUTH CAROLINA. PROPOSED IMPLEMENTATION PLAN REVISIONS. *Federal Register, 39(106):19229-19230, May 31, 1974.*

The proposed South Carolina revision of implementation plans consists primarily of changes in the limitations of sulfur dioxide emissions from fuel combustion sources. The present limits would be replaced by less stringent limits to be applied on the basis of a County classification system. On the basis of diffusion modeling results and other considerations, the State's Counties are put into the various classifications. The new limits are described, and interested persons are encouraged to obtain complete information or to submit written comments.

**41127** **APTIC NO. 63310**

Utidjian, H. Michael D.

EXCERPTS FROM CRITERIA FOR A RECOMMENDED STANDARD...OCCUPATIONAL EXPOSURE TO SULFUR DIOXIDE. I. RECOMMENDATIONS FOR A SULFUR DIOXIDE STANDARD. *J. Occup. Med., 16(6):406-411, June 1974.*

The most recently published National Institute for Occupational Safety and Health Criteria Documents for sulfur dioxide is reviewed. Sections 1 and 2 of Chapter 1 are reproduced in full, Chapter 4 is excerpted, and Chapters 5 and 6 are reproduced in full. According to the criteria, occupational exposure to SO2 should not be greater than 2 ppm determined as a time-weighted average exposure for an 8-hour work day. Section 1 describes sampling, calibration, analysis procedures; Section 2 describes medical procedures. Chapter 4 (Environmental Data and Biologic Evaluation) discusses animal experiments on SO2 toxicity which show a correlation of SO2 concentrations with measured plasma S-sulfonate levels. Chapter 5 (Development of Standard) describes the basis for previous standards and the basis for the new recommended standard by reviewing human and animal experiments. Chapter 6 (Compatibility with Ambient Air Quality Standards) lists the national primary and secondary ambient air quality standards for sulfur oxides and shows that no direct comparison can be made between national air quality standards and recommended standards for occupational exposure.

**41128** **APTIC NO. 62963**

Dutch Committee for Prevention of Disasters by Hazardous Substances, Subcommittee Toxicity

PUBLIC EMERGENCY LIMITS. *Staub, Reinhaltung Luft, 34(3):85-87, March 1974. 2 refs.*

Recommendations concerning Public Emergency Limits (PEL) for some chemicals which can constitute a potential threat to the health of the general population at some levels are given. The PEL philosophy and criteria are discussed. Emphasis is placed on the lack of proper basic data and the resulting degree of uncertainty. Tentative PEL values are recommended for acetonitrile, acrylonitrile, allyl chloride, ammonia, chlorine, ethylene oxide, and phosgene. (Author abstract modified)

**41129** **APTIC NO. 63394**

Environmental Protection Agency, Washington, D. C.

IRON AND STEEL MANUFACTURING POINT SOURCE CATEGORY. *Federal Register, 39(126):24114-24130, June 28, 1974.*

This notice establishes final effluent limitation guidelines for existing sources and standards of performance and pretreatment standards for new sources in the iron and steel manufacturing category of point sources. The limitation guidelines are proposed for new sources within the by-product coke subcategory, beehive coke subcategory, sintering subcategory, blast furnace (iron) subcategory, blast furnace (ferromanganese) subcategory, basic oxygen furnace (semiwet air pollution control methods) subcategory, basic oxygen furnace (wet air pollution control methods) subcategory, open hearth furnace subcategory, the electric arc furnace (semiwet air pollution control methods) subcategory, electric arc furnace (wet air pollution control methods) subcategory, vacuum degassing subcategory, and the continuous casting subcategory of the iron and steel manufacturing category of point sources. Effluent limitations guidelines represent the degree of effluent reduction attainable by the application of the best practicable control technology currently available.

## 1961

**41130** **APTIC NO. 60812**

VDI (Verein Deutscher Ingenieure), Duesseldorf (West Germany), Kommission Reinhaltung der Luft Subcommittee on Sulphur-Dioxide Effects

PERMISSIBLE IMMISSION CONCENTRATIONS OF SULPHUR DIOXIDE. *(Maximale Immissions-Konzentrationen (MIK) Schwefeldioxyd). VDI (Ver. Deut. Ingr.) Richtlinien, no. 2108, Nov. 1961. 26 refs. Translated from German. Dept. of Commerce. Joint Publications Research Service, Public Health Service APTD-1478, 18p.*

The occurrence, utilization, properties, determination, and effect of sulfur dioxide are reviewed. In concentrations of 100 cu cm/cu m and over, SO2 causes strong irritation of the mucosa and interruption of respiration in man. In concentrations of 10-50 cu cm/cu m, SO2 becomes perceptible by its strong odor and disagreeable taste and causes throat irritation. Effects of 1-10 cu cm/cu m on respiration are contradictory. The threshold value for perception by smell and taste is 0.3-1.0 cu cm/cu m. Sulfur dioxide also effects animals and causes plant damage. Concentrations of 1-2 cu cm/cu m cause acute plant damage, especially to leaves, through necrosis. Plant reactions are dependent on concentration of and duration of SO2 exposure. Plants will tolerate certain amounts of SO2 without damage, this is the first tolerance limit. The complex of factors which determine whether plant damage occurs after exceeding the first tolerance limit is the second tolerance limit.

Sulfur dioxide does little damage to buildings, except when sulfuric or sulfurous acid are formed. The permissible emission concentrations of sulfur dioxide (emission criteria) are given for half hour values. These are 0.5 mg/cu m equal to 0.2 cu cm/cu m of air for continuous exposure 0.75 mg/cu m equal to 0.3 cu cm/cu m of air for intermittent exposure, and 13 mg/cu m equal to 5.0 cu cm/cu m of air for permissible working place concentration.

## LEGAL AND ADMINISTRATIVE

### 1974

**41131** **APTIC NO. 63396**

Busch, Arthur W.

NEW MEXICO; APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. *Federal Register, 39(120):22159-22160, June 20, 1974.*

The adoption of an Air Quality Control Regulation 705, Schedule of Compliance by the State of New Mexico, Sept. 24, 1973, requiring increments of progress toward the implementation of the national ambient air quality standards is presented. This was done in order to correct the failure of New Mexico to meet the requirements for implementation plans as applied to the States Air Quality Control Regulations 504.D (emission limitation for particulate matter from coal burning equipment), 506.B (emission limitation for particulate matter from nonferrous smelters), 602.B (emission limitation for sulfur dioxide from existing coal burning equipment), 603.B (emission limitation for nitrogen dioxide from existing coal burning equipment), 604.B (emission limitation for nitrogen dioxide from existing gas burning equipment), and 652.A (emission limitation for sulfur from existing nonferrous smelters.

**41132** **APTIC NO. 63000**

Calder, Kenneth L.

THE PILOT STUDY ON AIR POLLUTION FOR THE NATO COMMITTEE ON THE CHALLENGES OF MODERN SOCIETY. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., Meteorology Lab., 20p., April 1974.*

A pilot study on air pollution is described which consisted of examining and proposing appropriate air quality simulation models for sulfur oxides and particulates for application to ongoing air pollution studies in Ankara, Frankfurt, and St. Louis. Meetings of the NATO/CCMS Expert Panel on Air Pollution Modeling which conducted the study are reviewed. The participants at the meetings, topics of discussion, and contents of a proceedings are given.

**41133** **APTIC NO. 63393**

De Falco, Paul, Jr.

CALIFORNIA AIR QUALITY STANDARDS: PROPOSED COMPLIANCE SCHEDULES. *Federal Register, 39(125):23274-23276, June 27, 1974.*

This proposal is for the approval and adoption of revisions to the compliance schedule portions of the California Plan for the implementation of the national ambient air quality standards. Each proposed compliance schedule revision establishes a new date by which an individual air pollution source must comply with an emission limitation specified by the implementation plan. Public inspection of the proposed compliance schedule revisions is available at designated places.

**41134** **APTIC NO. 64458**

DeFalco, Paul, Jr.

CALIFORNIA: APPROVAL AND PROMULGATION OF STATE IMPLEMENTATION PLANS. *Federal Register, 39(124): 23069-23070, June 26, 1974.*

Conditional approval is proposed for portions of the California Air Pollution Emergency Contingency Plan submitted to the Administrator by California as part of its Implementation Plan for Achieving and Maintaining the National Ambient Air Quality Standards (California SIP). The effect of these proposed regulations will be to grant conditional approval of the episode plan described in Revision 4 of the State Implementation Plan. These regulations required, as part of each State Air Quality Standards Implementation Plan (SIP), the establishment of an Air Pollution Emergency Episode Contingency Plan. Conditional approval of this plan will transfer to the State of California the responsibility for CO and oxidant episode response in the San Francisco Bay Area, Metropolitan Los Angeles and San Diego Intrastate Air Quality Control Regions and for sulfur dioxide episode response in the San Francisco Bay Area and Metropolitan Los Angeles Intrastate Air Quality Control Regions. The Plan is disapproved for all other Priority I and II regions in the State. The conditions set forth are presented in the form of a compliance schedule. The State is asked to correct several technical deficiencies by Sept. 15, 1974, submit Air Pollution Control District (APCD) rules, state procedures for episodes under the Peacetime Emergency Plan, and improve procedures for interdistrict coordination by Nov. 30, 1974.

**41135** **APTIC NO. 64781**

Domen, Tomohisa

THE PRESENT STATE OF AUTOMOBILE EMISSION REGULATION AND AUTOMATIC TEST OF EXHAUST GASES. *(Jidosha haikigasu kisei no genjo to haikigasu jido shiken). Text in Japanese. Nainen Kikan (Int. Combust. Engine), 13(6):25-33, May 1974.*

Enforcement of the 1975 regulation will make it possible to lower the emission levels of carbon monoxide, hydrocarbons, and nitrogen oxides to 89%, 91%, and 45%, respectively, for passenger car. One problem with the 1975 regulations is that the projected average reduction rates of CO, HC, and NOx for trucks and buses are 29%, 28%, and 17%, respectively, all of which are more loosely regulated than passenger car. A computer-aided automatic exhaust gas analyzer consisting of minicomputer, a high-speed tape reader subsystem, a typewriter subsystem, a running pattern indicator, a test operation panel, a remote control, a digital input and output mechanism, and an analog input and output device is described.

**41136** **APTIC NO. 63366**

Dreissigacker, Hans-Ludwig, Friedrich Surendorf, and Erich Weber

THE DRAFT OF THE TECHNICAL DIRECTIVES FOR THE MAINTENANCE OF CLEAN AIR - BROUGHT UP TO DATE TO THE PRESENT-STATE-OF-THE-ART. *(Zum Entwurf der Technischen Anleitung zur Reinhaltung der Luft. Dem Stand der Technik angepasst). Text in German. Umwelt (Duesseldorf), 4(3):20-23, 1974. (Also: Oel Gasfeuerung, 19(5): 386-389, 1974.)*

The Technical Directives for the Maintenance of Clean Air of the year 1964 have been revised and the draft has now been presented for approval. The new Directives take account of the present state of the art. They are the first general administrative regulation to the Federal Immission Protection Act. They state the conditions upon which the licensing process of new plants is initiated. These are the operation of the plant in a manner which does not raise the emission concentrations in the vicinity of the plant, the installation of latest state of the art equipment for limitation of the emissions and sufficient distribution of unavoidable emissions. The present state-of-the-art is described in the Directives. Emission standards are set on the basis of the latest scientific findings particularly with regard to medical biological effects of air pollutants. The emission limits of sulfur dioxide were drastically reduced from 0.4 to 0.14 mg/cu m (long-term concentration) and from 0.75 to 0.4 mg/cu m (short-term concentration).

**41137** **APTIC NO. 63111**

Duke, Ann, Marvin Hertz, Kirby Kyle, and George H. Ward

A COMPUTER CONTROLLED DATA ACQUISITION AND RETRIEVAL SYSTEM FOR USE IN AIR MONITORING PROGRAMS. *Preprint, Environmental Protection Agency, Research Triangle Park, N. C., 8p., 1974. 1 ref.*

A computer controlled data acquisition and retrieval system for use in the Community Health Air Monitoring Program (CHAMP) is reviewed. The heart of the CHAMP network is an automated data acquisition system employing intelligent controllers at both a central site and a network of remote monitoring stations. A minicomputer at each of the local stations controls and acquires data from aerometric instrumentation and transmits the data by phone lines to a central computer facility where the values are recorded and validated for use in the health effects studies. Total system capabilities are realized using a dual processor controller in the central facility operating in a foreground/background mode; semi-real time acquisition via telecommunications system and data recording are handled in foreground, and processing, validity checking, tabulation, and reduction are accomplished as background tasks. A functional description of the system is given, including a data flow diagram and a discussion of the machine validation criteria. (Author abstract modified)

**41138** **APTIC NO. 63133**

Feldhaus, Gerhard

COMMENTARY: THE FEDERAL IMMISSION PROTECTION LAW. *(Kommentar: Zum Bundes-Immissionsschutzgesetz-Immission von Schadstoffen und ihre Wirkung. Text in German. Staub, Reinhaltung Luft, 34(6):203-206, June 1974.*

Under the new Environmental Protection Act new industrial plants will have to be licensed, the procedure for which is discussed in detail. In areas of high pollution special measures will be taken. The continuous monitoring of pollutants will be mandatory in such areas. Emission inventories will provide information on all major industrial sources, domestic heaters, and automobiles. Plants which require operating licenses must submit annual statements on the amount of their emissions. State authorities will be required to arrange special programs for the reduction of pollutants in heavily polluted areas.

**41139** **APTIC NO. 63295**

Harmsen, Hans

ENVIRONMENTAL PROTECTION CALLS FOR THE PERSONAL EFFORT OF EACH INDIVIDUAL. *(Umweltschutz erfordert persoenliches Handeln jedes einzelnen). Text in German. Umwelthygiene, 25(4):70-74, April 1974.*

Global problems of environmental pollution, such as waste production and air and water pollution, which are the consequences of industrialization and population explosion, are discussed. The ever-increasing consumption of fossil fuels has resulted in a rise in the atmospheric carbon dioxide concentration which may lead either to an elevation or a drop in the temperature of the atmosphere. The stepped-up fuel consumption also results in large volumes of sulfur dioxide, nitrogen oxides, carbon monoxide, hydrocarbons and particulate emissions. As an approach to environmental production, all products which may cause environmental hazards and pollution, such as disposable products and packagings and gasoline, should be taxed to curb consumption. Traffic-generated air pollution can be abated at the same time by subsidizing public transportation.

**41140** **APTIC NO. 63185**

Koerner, H. J.

AIR QUALITY MEASUREMENTS OF THE MEASURING-AND TESTING AGENCY. *In: Air Hygienic Meteorological Model Studies of the Lower Main Region. Report 5. Regional Planning Assoc., Lower Main Region, Frankfurt am Main (West Germany), p. 93-99, June 1974. 2 refs.*

The Measuring and Control Station for the Trade Inspection Agency of the State of Hesse carried out sulfur dioxide and dust fall measurements in the area Frankfurt/Main - Offenbach, Hanau and Grosskotzenburg. The sulfur dioxide measurement grid which spans an area of 167 sq km consists of 203 measuring points. The dust fall measurement grid covering 114 sq km comprises 142 measuring stations. The SO2 samples are taken at the individual points by a mobile station at a level of 1.5 m above the ground. Sulfur dioxide random samples are taken at every measuring point every other week. The sampling period for dust fall is 30 plus or minus two days. The results of these measurements are not in yet.

**41141** **APTIC NO. 63182**

Krebs, J.

DESCRIPTION OF THE INVESTIGATION AREA. *In: Air Hygienic Meteorological Model Studies of the Lower Main Region. Report 5. Regional Planning Assoc., Lower Main Region, Frankfurt am Main (West Germany), p. 1-13, June 1974.*

The Untermain (Lower Main) region is the second largest metropolitan area in the Federal Republic of Germany after the Rhine-Ruhr area. The study area includes the cities of Frankfurt, Hanau and Offenbach, parts of the counties of Darmstadt, Dieburg, Gross-Gerau, Hanau, Hochtaunus, Offenbach and Wetterau. The climate in the study area is characterized by frequent calm, almost windless weather. The entire study area was divided into four sub-areas. The large industrial complexes are mainly located along the Main river (sub-area I). A detailed description of the industries, trades, and service organizations located in the four sub-areas is given.

**41142** **APTIC NO. 64731**

Lemmon, W. A.

AIR POLLUTION CONTROL IN CANADA. *Chem. Economy Eng. Rev., 6(3):30-36, March 1974.*

The basic air pollution control philosophies in Canada are dilution and dispersal of pollution and containment at the source. The two methods of carrying out the philosophy of containment are the use of the air resource management approach and the best practicable technology approach. Federal legislative activities carried out under the Clean Air Act include promotion of a uniform approach across Canada, provision for the mechanisms and institutions needed to ensure that all measures to control air pollution can be taken, and provision of Federal leadership. The organization of the air pollution control activities is centered in the Environmental Protection Service of Environment. The various national programs to control air pollution include the National Air Pollution Surveillance Program, development of ambient air quality objectives, the development of air pollution inventories, the development of national emission standards and of national emission guidelines, development of emission standards for Federal facilities, development of mobile source and fuel and fuel additive regulations, and Federal-Provincial agreements and cooperation. Air pollution control today in Canada is generally reviewed, including estimated nationwide emissions, alert systems, and emissions and control in the following industries: asbestos mining and milling, iron ore beneficiating and indurating, aluminum smelting, nonferrous smelting, portland cement, thermal power plant, iron and steel, ferroalloy, and petroleum.

**41143** **APTIC NO. 63172**

Matsuzaki, Isaho

POLLUTION INFORMATION MANAGEMENT BY COMPUTER AND AN APPROACH FOR THE ENVIRONMENTAL EVALUATION. *(Conputa ni yoru kogai joho kanri to kankyo asesumento e no apurochi). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 3(6):397-402, June 1974. 11 refs.*

Two objectives in the development of computer technology are the application of the technique to long-range planning operation and the forecasting and control of environmental pollution. An approach to environmental assessment by data processing systems is introduced. The characteristics of any assessment are the involvement of multiple subjects and multiple standards of evaluation. A system of data processing for environmental assessment involving multiple subjects and their correlations are shown in a schematic diagram. The methodology for the systematic and level structured approach to the environmental problem is not clearly established. The criteria used in one study of environmental assessment are long-term, wide-range problems, short-term, small-range problems, and medium-term, medium- range problems. Computer technology is used for monitoring pollution data and forecasting based on relatively simple models. An example of environmental assessment using the data processing system is given, and the adequacy of the system in practical applications is evaluated.

**41144** **APTIC NO. 63361**

McKee, Herbert C.

TEXAS REGULATION REQUIRES CONTROL OF OPACITY USING INSTRUMENTAL MEASUREMENTS. *J. Air Pollution Control Assoc., 24(6):601-604, June 1974. 6 refs. (Presented at the Air Pollution Control Association, Annual Meeting, Chicago, Ill., June 1973.)*

For over four years, a Texas air pollution control regulation has been in force which permits use of a stack-mounted transmissometer instrument to measure visible emissions, thus avoiding the necessity for visual observations. Many types of industrial plants have installed instruments, and extensive experience has been obtained with this method of measurement and control. Plant operators and enforcement officials have expressed a strong preference for this method, both to demonstrate compliance and to provide data to aid in operating control equipment. Some operational problems have been encountered, but these usually can be overcome with proper care. Because of the advantages obtained with this regulation, a new regulation has been adopted which makes the instrumental method mandatory for large sources of visible emissions. (Author abstract)

**41145** **APTIC NO. 63142**

Meyers, Sheldon

COMMENTS ON ENVIRONMENTAL IMPACT STATEMENTS AND OTHER ACTIONS IMPACTING THE ENVIRONMENT. NOTICE OF AVAILABILITY. *Federal Register, 39(113):20533-20536, June 11, 1974.*

The Environmental Protection Agency has reviewed and commented in writing on Federal agency actions impacting the environment during May 1, 1974 to May 15, 1974. These agencies, the nature of comments, and the source for copies of comments are listed in appendices. The appendices include draft environmental impact statements reviewed and commented upon in writing; definitions of the classifications of EPA s comments on the draft environmental impact statements; a listing of final environmental impact statements reviewed and commented upon; a listing of proposed Federal agency regulations, legislation proposed by Federal agencies, and other proposed actions reviewed and commented upon in writing; and a listing of the names and addresses of the sources for copies of EPA comments listed in other appendices.

**41146** **APTIC NO. 64755**

Meyers, Sheldon

ENVIRONMENTAL IMPACT STATEMENTS. AVAILABILITY OF ENVIRONMENTAL PROTECTION AGENCY COMMENTS. *Federal Register, 39(157):29046- 29049, Aug. 13, 1974.*

The availability of Environmental Protection Agency comments on Federal agency actions impacting the environment during the period of July 1 and July 15, 1974 is announced. Appendix I contains a listing of draft environmental impact statements. Appendix II contains the definitions of the classifications of EPA s comments on the draft environmental impact statements. Appendix III contains a listing of final environmental impact statements. Appendix IV contains a listing of proposed Federal agency regulations, legislation proposed by Federal agencies, and any other proposed actions pursuant to section 309(a) of the Clean Air Act, as amended. In all cases, the listing includes the Federal agency responsible for the statement, the number and title of the statement, a summary of the nature of EPA s comments, and the EPA source for copies of the comments. Appendix V contains a listing of the names and addresses of the sources for copies of EPA comments listed in Appendices I, III, and IV.

**41147** **APTIC NO. 64862**

Meyers, Sheldon

ENVIRONMENTAL IMPACT STATEMENTS. AVAILABILITY OF EPA COMMENTS. *Federal Register, 39(70):13026-13028, April 10, 1974.*

The Environmental Protection Agency has reviewed and commented in writing on Federal agency actions impacting the environment contained in the following appendices during the period of March 1, 1974 and March 15, 1974. Appendix I contains a listing a draft environmental impact statements. Appendix II contains the definitions of the classifications of EPA s comments on the statements. Appendix III contains a listing of final environmental impact statements. Appendix IV contains a listing of proposed Federal agency regulations, legislation proposed by Federal agencies, and any other proposed actions. Appendix V contains a list of the names and addresses of the sources for copies of EPA comments listed in Appendices I, III, and IV.

**41148** **APTIC NO. 64703**

Meykar, Orest A.

PROGRESS OF PROTECTION OF THE ENVIRONMENT AND RESOURCES IN THE UNITED STATES - A HISTORICAL SURVEY. *IEEE (Inst. Elec. Electron. Engrs.) Trans. Aerosp. Electron. Systems, AES10(4):521-527, July 1974. (Presented at the Institute of Electrical and Electronics Engineers, Centroamerican Convention, 4th, San Salvador, El Salvador, Aug. 1973.)*

State and Federal legislative actions intended to improve and preserve the quality of our environment and to conserve our natural resources were developed and implemented in a logical sequence and synchronized with social development and awareness of the need for specific legislative, punitive, or constructive actions. At all times, the desired legislation was developed through a consensus of opinions, needs, and costs that were to be incurred by the affected parties. In some cases, the Federal Government found it necessary to increase its budget allocations in areas where immediate relief was needed and large losses were anticipated. The major environmental protection accomplishments and legislative initiatives are discussed. The development of criteria and standards, enforcement of laws, and international cooperation are reviewed. The decisive steps to control and protect the environment are in the following major areas of concern: water, air, noise, pesticides, radiation, solid waste disposal, and control of hazardous substances such as mercury, beryllium, asbestos, and carcinogens. (Author abstract modified)

**41149** **APTIC NO. 63208**

Porter, Richard C.

THE LONG-RUN ASYMMETRY OF SUBSIDIES AND TAXES AS ANTIPOLLUTION POLICIES. *Water Resources Res., 10(3):415-417, June 1974. 11 refs.*

Primers on the discharge of unwanted but unpriced effluents into the air and water now treat as commonplace the symmetric between taxes (or charges) on effluents and subsidies (or bribes) for abatement as a means of reducing an industry s pollution. This note shows that, on the contrary, serious asymmetry results when entry and exit occur in response to subsidies or taxes. Not only does the quantitative symmetry disappear, but even the qualitative impact (i.e., the directions of the effects) of charges and bribes on the volume of firm and industry effluents may differ. More specifically, the possibility emerges that an abatement subsidy offered to an industry may increase the total effluents of that industry. (Author abstract)

**41150** **APTIC NO. 63391**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS: WYOMING; APPROVAL OF PLAN REVISIONS. *Federal Register, 39(129):24504-24505, July 3, 1974.*

An approval of revisions to the compliance schedule set forth in Wyoming s Implementation Plan for the attainment of National Ambient Air Quality Standards, and to attainment date portions of the approved plan is presented. The revisions change the date for the attainment of the secondary particulate matter standard throughout the State. In the Cheyenne Intrastate Region, the attainment date is changed from June 30, 1973 to January 31, 1974. This attainment date is within a reasonable time from Wyoming s plan approval. The same approval for change of dates applies to the Casper Intrastate Region (changed to September 30, 1976), and the Wyoming Intrastate Region (changed to May 15, 1977). A described 30-day public comment period together with the availability of the proposed revisions for public inspection assured ample opportunity for public participation.

**41151** **APTIC NO. 63392**

Quarles, John

PREPARATION OF ENVIRONMENTAL IMPACT STATEMENTS. *Federal Register, 39(138):26253-26270, July 17, 1974.*

A set of proposed rules establishing Environmental Protection Agency (EPA) policy and procedures for the identification and analysis of the environmental impact of Agency (EPA) actions, and the preparation and processing of environmental impact statements when significant impacts on the environment are anticipated are presented. These are published as proposed rulemaking because of the substantial changes that have been made in the regulation. The proposed regulation provides detailed procedures for applying the National Environmental Policy Act (NEPA) of 1969 to EPA s nonregulatory programs only. The new source permit program has not been included in this revision because the procedures for applying NEPA to this program have not been completed. Procedures for preparing impact statements on environmentally protective regulatory actions will be described in a notice of administrative procedure to be published in the Federal Register.

**41152** **APTIC NO. 64222**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. REVISIONS TO UTAH PLAN. *Federal Register, 39(113):20484-20485, June 11, 1974.*

Amendments to a regulation limiting the sulfur dioxide emission from the first operating unit of Utah Power and Light Company s Huntington Canyon power plant are promulgated by the Environmental Protection Agency administrator in response to smoke and particle tracer study results indicating that sulfur oxide dispersion rates under stable conditions are significantly greater than the rate used in the original model. The administrator is promulgating withdrawal of the sulfur dioxide regulation originally promulgated for the facility, revocation of the extension provided for the attainment of the primary standards for SO2, amendment of the Federal compliance schedule to exclude SO2 control for the first operating unit, and indication that ambient levels of SO2 in the Utah portion of the Four Corners Interstate Region are below the national standards.

**41153** **APTIC NO. 64708**

Quarles, John

CONTROL OF AIR POLLUTION FROM NEW MOTOR VEHICLE AND NEW MOTOR VEHICLE ENGINES. HYDROCARBON EXHAUST EMISSION STANDARDS AND TEST PROCEDURES TO PERMIT EXCLUSION ON METHANE. *Federal Register, 39(92):16904-16905, May 10, 1974.*

In response to a petition by the Ford Motor Co., the Environmental Protection Agency is considering proposing regulations which would employ the measurement of non-methane hydrocarbons, rather than total hydrocarbons, to determine compliance with Federal motor vehicle and motor vehicle engine emission standards. In making such a change, the numerical values of exhaust emission standards for hydrocarbons would be changed to equivalent values expressed in terms of non-methane hydrocarbon emissions. However, while the conversion of motor vehicle exhaust hydrocarbon standards to a non-methane hydrocarbon basis would appear a technically desirable goal, such a change would require significant expenditures of resources by the EPA, motor vehicle manufacturers, and other motor vehicle emissions testing laboratories for modification of existing equipment and procedures. Furthermore, before such proposed rulemaking could be promulgated, substantial efforts would be required by the EPA to establish revised testing procedures and to determine the magnitudes of non-methane hydrocarbon emission standards equivalent ot present total hydrocarbon standards. In order to obtain further information comments are particularly solicited on the following aspects: identification of non-reactive hydrocarbon components of motor vehicle exhaust which should be excluded in determining compliance with motor vehicle emission standards; availability of methods for routine measurement of non-reactive hydrocarbon components in motor vehicle exhaust; quantities of reactive and non-reactive hydrocarbon compounds in motor vehicle exhaust; impact of total vs. reactive hydrocarbon standards; lead time required for implementation of non-reactive hydrocarbon testing; and impact of reactive hydrocarbon standards on other motor vehicle compliance efforts.

**41154** **APTIC NO. 64754**

Quarles, John

STATES OF IOWA AND MISSOURI. *Federal Register, 39(140):26423, July 19, 1974.*

The State Implementation Plans of Iowa and Missouri are discussed. The Plans were approved with specific exceptions on May 31, 1972. The approval or disapproval by the Environmental Protection Agency is amended as a result of supplemental information supplied by Iowa and the deletion of the implementation plan requirements for prevention of emergency episodes. Missouri had not met the requirements in their Plan.

**41155** **APTIC NO. 64806**

Quarles, John

KENTUCKY: APPROVAL OF PLAN. *Federal Register, 39(159):29357- 29359, Aug. 15, 1974.*

The approval of the Kentucky State Implementation Plan is announced. The Kentucky Plan meets national standards for particulate matter, sulfur oxides, hydrocarbons, photochemical oxidants, and nitrogen oxides. The plan includes an indirect source regulation which provides for the pre-construction review of new or modified sources of air pollution. The requirements of 52.12 are not met because section 1 (b) of regulation AP-1 may be interpreted as permitting the use of intermittent controls in cases where constant controls are available.

**41156** **APTIC NO. 64962**

Quarles, John

ECOLOGY ADVISORY COMMITTEE. *Federal Register, 39(159):29419, Aug. 15, 1974.*

The Ecology Advisory Committee is established as an entity of the Science Advisory Board in connection with the peformance of duties imposed on the U. S. Environmental Protection Agency by law. The committee will provide to the Administrator and to the Agency expert and independent advice on issues relating to scientific and technical problems associated with ecological studies of pollution in the environment, including movement of materials, specific effects on biological systems, and the technical programs and priorities among them required to resolve these problems.

**41157** **APTIC NO. 64963**

Quarles, John

APPROVAL AND PROMULGATION OF IMPLEMENTATION PLANS. TRANSPORTATION AND LAND USE CONTROLS. *Federal Register, 39(19):27797-27798. Aug. 1, 1974.*

This promulgation amends the regulation and clarifies the applicability intended by the regulation for limitation of new reactive carbon compound emission sources. This section was intended to apply to chemical processing, and petroleum refining and petrochemical sources. Chemical processing was intended to include paint manufacturing, but not paint application processes.

**41158** **APTIC NO. 63173**

Shimizu, Ryuji

AN ASSESSMENT OF THE ENVIRONMENT. *(Kankyo asesumento). Text in Japanese. Kankyo Gijutsu (Environ. Conserv. Eng.), 3(6):390-396, June 1974.*

The philosophy of environmental control is described by citing the United Nations Human Environment Declaration. The concept and procedure for environmental assessment are discussed. The environmental protection policy approved at the cabinet meeting on June 6, 1972, the intermediate report (December 17, 1972) on the control measures taken at certain appointed areas, and the environmental control policy issued by NEPA in the U.S.A. are summarized. Environmental assessment is defined as the total assessment of the environmental effect of an undertaking made prior to its operation. The procedure for the enforcement of environmental assessment is that the developer makes an obligatory assessment which is subject to the approval by a governmental agency. By such a procedure, environmental control measures can be included in the development plan itself. The concept of environmental standard is defined. The estimation and evaluation of the environmental effect of a new undertaking are made by a simulation analysis on the emission of pollutants, emission conditions, source conditions, and meteorological and other natural conditions.

**41159** **APTIC NO. 64733**

Snyder, Daniel

STATE IMPLEMENTATION PLANS. WEST VIRGINIA: PROPOSED COMPLIANCE SCHEDULES. *Federal Register, 39(143):26916-26917, July 24, 1974.*

Proposed revision to the West Virginia State Implementation Plan is announced. Each proposed compliance schedule establishes a date by which an individual air pollution source must attain compliance with an emission limitation of the State Implementation Plan. The schedule includes incremental steps toward compliance with interim dates for achieving those steps. Public comment is

**41160** **APTIC NO. 63324**

Syrota, Jean

AIR POLLUTION MONITORING NETWORKS. *(Reseaux de mesure de la pollution atmospherique). Text in French. Pollut. Atmos. (Paris), 16(61):55-82, Jan.-March 1974.*

A general description is given of air quality monitoring stations, and the global program of establishing a national air quality monitoring network to comprise 750 sampling stations by 1978 in France is presented. Air quality monitoring networks are essential for the definition of the national air pollution control policies, for information on the evolution of the pollution level, for space planning purposes, and for the short-term prediction of pollutant concentrations. While sampling stations without telecommunication facilities will be installed in rural areas, industrialized and urban areas with high pollutant backgrounds will receive sampling stations integrated into a central computerized data processing and alarm system. The monitoring stations that will be sited according to the results of previous simulation studies will monitor dust fall, sulfur dioxide, carbon monoxide, and nitrogen oxides concentrations on a permanent basis. Meteorological parameters, such as wind speed and direction, temperature, humidity, precipitation, solar radiation, and possible barometric pressure will also be monitored. The West-Gaeke colorimetric, conductimetric, acidimetric, coulometric, and flame photometric methods are optionally available for the determination of SO2 concentrations in the air. A brief description is given of air pollution monitoring and alarm systems established in foreign countries, such as the USA, the Netherlands, and Japan.

**41161** **APTIC NO. 63146**

Train, Russell E.

WASHINGTON AIR IMPLEMENTATION PLAN. PROMULGATION FOR VARIANCES AND REVIEW OF NEW SOURCES. *Federal Register, 39(113):20511-20513, June 11, 1974.*

The Natural Resources Defense Council, Inc. (NRDC) challenged the approval of Washington State s variance and new source review procedures for the air implementation plan. The challenge stated that the variances do not satisfy sections of the Clean Air Act and defer compliance with national ambient air quality standards, and that new source review procedures are not in strict conformance with the Clean Air Act or regulations. Although revisions have now been made, they do not satisfy all of NRDC s challenges or cure all the defects inherent in the original plan submission. The various issues disputed by the NRDC and the Environmental Protection Agency s opinions on these issues are reviewed. The Environmental Protection Agency proposes disapproval of portions of the variances and source review procedures and their replacement. The proposed amendments to the Washington implementation plan are given.

**41162** **APTIC NO. 63131**

Japan Environmental Agency, Tokyo, Air Quality Bureau

AN OUTLINE FOR THE 1974 PHOTOCHEMICAL AIR POLLUTION INVESTIGATION COMMITTEE INSTALLATION AND A DIRECTORY OF MEMBERS. *(Showa 49-nendo kokagaku hanno ni yoru taiki osen chosa jinkai secchi yoko oyobi iin meibo). Text in Japanese. 17p., April 1974.*

The purposes, structure and functions of the special committee for the 1974 photochemical air pollution investigation, and the member s names, addresses, and present positions are presented. The committee is headed by a chairman and a vice chairman, and comprises three sub-committees with a chairman each. The subcommittee for air quality investigation will gather basic data for better understanding of photochemical smogs, and take measurements of pollutants and investigate weather conditions of the lower atmosphere of the Osaka Bay area. The subcommittee for health investigation will conduct epidemiological and clinical health examinations with groups of schoolchildren in Tokyo and Osaka, record precise environmental conditions at the time of photochemical smog incidents, record health impairment, and find the relationship between symptoms and the environment. The subcommittee on the smog chamber investigation will utilize mobile smog chambers in Tokyo and Osaka Bay areas to clarify photochemical pollutant formation factors.

**41163** **APTIC NO. 64490**

AN OUTLINE FOR THE PARTIAL REVISION BILL FOR THE AIR POLLUTION CONTROL LAW. *(Taiki osen boshiho ichibu kaiseihoan yoko). Text in Japanese. Aromatikkusu (Aromatics), 26(4):178-180, 1974.*

The Japanese government is about to send to the Diet for its ratification a partial revision bill for the Air Pollution Control Law for pollutant emission quantity regulation. The previous method of regulation was to determine the amount of emission quantity by individual emission sources. In the revised bill, the total emission quantity is to be determined by each locality, and each factory unit will be allotted a maximum allowable emission quantity. Therefore, the future pollution control will be achieved by regulating both pollutant concentration and emission quantity. The Japan Environmental Agency will first designate areas to be subjected to sulfur oxides control regulations. The enforcement of the 1974 target concentration will begin July 1974. The total emission standards for Japan will be more stringent in general, and several cities were added to the previous list of cities subjected to the special control regulations. According to the 1972 investigation of the continuous monitoring network of Japan, of the 248 cities and 685 monitoring stations, 236 cities and 670 stations (98%) passed the previous environmental standard. By the new environmental quality standard of May 1973, only 34% of these will have passed. The new emission standards are based on the K (caloric) value of 1974.

**41164** **APTIC NO. 64680**

Japan Environmental Agency, Air Protection Bureau

OUTLINE OF EXECUTING AN INVESTIGATION ON THE INFLUENCE OF PHOTOCHEMICAL AIR POLLUTION ON PLANTS. *(Kokagaku taiki osen shokubutsu eikyo chosa jisshi yoryo). Text in Japanese. 16p., May 1974.*

Air pollution due to photochemical reactions in cities in the U. S. and Japan is examined utilizing plant indicators. The survey method for Japan is given, including the actual areas to be investigated, the control areas, the agencies which actually execute the investigation, the experimental condition, the duration, the method of actual investigation, and the species of plant indicator. The plant indicators are morning glory, spinach, Swiss chard, and peanut. Those of possible interest are petunia, Chinese cabbage, welsh onion, taro, and radish. Methods of cultivating these plants are designated. The area to be investigated includes photochemically polluted prefectures Tokyo, Saitama, Chiba, Kanagawa, Osaka and Hyogo, and Nagano is used as the control area. Details of planning, discussion, guidance of investigation, and evaluation will be given. Environmental conditions such as concentration of oxidants and sulfur dioxide, temperature, relative humidity, and amount of time of sunshine, wind direction and speed, and sedimentation will be taken from the data given by already established bureaus of air pollution measurement.

**41165** **APTIC NO. 64940**

A GUIDELINE FOR THE EVALUATION OF ENVIRONMENTAL EFFECTS (A PROGRESS REPORT). *(Kankyo eikyo hyoka no unyojo no shishin ni tsuite (chukan hokoku). Text in Japanese. Kenkocho Kogai Senmon Shiryo (Public Nuisance Gaz.), 9(4):24-35, July 1974.*

Standards for environmental protection are based on human health, purity of living environment, and conservation of the natural environment. New environmental standards are required for newly recognized pollutants while existing standards must be reviewed constantly and revised when necessary. Pollutant standards which have been studied include those for hydrocarbons, lead, and fluorides. The most basic condition for evaluating the environmental effect is complete information on pollution sources, population, traffic, and meteorological data. In air pollution evaluation, in addition to sulfur oxides, nitrogen oxides, carbon monoxide, and airborne particulates, predictions of other industrial pollutants must be carried out by diffusion models. Meteorological conditions required for the prediction include average temperature, amount of precipitation, and wind velocity. Air pollution from fixed sources are evaluated by the type of fuel used and their total consumption, and those from moving sources are evaluated by total numbers of vehicles and traffic and road conditions.

**41166** **APTIC NO. 64954**

SPECIAL REGULATIONS CONCERNING ENVIRONMENTAL PROTECTION IN THE THIRD TAX REFORM BILL. *(Sondervorschriften fuer den Umweltschutz im 3. Steuerreformgesetz). Text in German. Chem. Ind. (Duesseldorf), 26(3):165-166, March 1974.*

Special tax deductions are allowed for all economic means serving the protection of the environment, according to the third tax reform bill of the Federal Republic of Germany. Economic means serve the protection of the environment if they are used to prevent the production of waste water, damages by waste water, air pollution, noise, and vibrations or they serve to eliminate or reduce pollution of any kind. Plants for recycling are excluded from any tax deduction. The higher tax deductions pertain only to equipment bought and installed prior to Jan. 1, 1975.

## 1973

**41167** **APTIC NO. 63209**

Hindelang, Franz J.

RESEARCH IN GERMANY ON FLUID-DYNAMICS OF AIR POLLUTION RELATED TO AIRCRAFT OPERATIONS (PAPER IV). *In: The Fluid Dynamics Aspects of Air Pollution Related to Aircraft Operations. Technisce Univ. Muenchen (West Germany) Advisory Group for Aerospace Research and Development AR-55, p. 27-30, 1973 (?).*

There has been very little research in Germany on the fluid-dynamics of air pollution related to aircraft operations. A literature survey showed many good papers on air pollution, but nothing on air pollution related to aircraft operation. A questionnaire sent to meteorologists, aerodynamicists, and aircraft industries revealed a few studies on aircraft as a cause of pollution, and a lot of work on air pollution fundamentals and on air chemistry.

**41168** **APTIC NO. 56826**

Inoue, Tsutomu

MEASURES FOR PREVENTING AIR POLLUTION IN THE CITY OF OSAKA. *(Osaka-shi ni okeru taiki osen boshi keikaku). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 9(9):871-887, Sept. 1973. 5 refs.*

Legislation, air quality, and air quality standards in Osaka are discussed. Sulfur oxides, nitrogen oxides, oxidants, and particulates are the major pollutants. The NOx emissions from fixed and moving sources will have to be reduced to 79.2 and

93.7% of the 1970 quantities to satisfy the national air quality standard. Particulates were reduced to 50% of the 1970 amount in 1972. The Osaka control program is discussed.

**41169** **APTIC NO. 62999**

Lowry, William P.

THE 1973 OPERATION REPORT FOR METROMEX. *Illinois State Water Survey, Urbana, National Science Foundation Contract GI-34797, Rept. ISWS-73-CON-150, 65p., Dec. 1973. 8 refs.*

NTIS: PB 228855

Project METROMEX is a federation of individual scientists with diverse sources of funding but complementary research objectives. The calendar of field observations conducted under METROMEX in the Greater St. Louis area during June-Aug. 1973 is described. Four agencies interested in the effects of urbanization on precipitation-related processes were involved in developing METROMEX. Argonne National Laboratory participation in METROMEX in 1973 included acoustic sounding to determine urban-rural differences and effects of meteorological factors on dispersion and WHAT System radiosonde and balloon measurements of wind and temperature profiles. The operations schedule for this program is given. Battelle Memorial Institute operation calendars are given for its trace constituent monitoring flights, ground level trace monitoring, and washout measurements. The operations calendars for University of Chicago flights and for Illinois State Water Survey projects are also presented. Operations calendars are also given for University of Missouri-Rolla, Stanford Research Institute, and University of Wyoming research.

**41170** **APTIC NO. 63096**

Mullen, P. A. and R. L. Dueker

AIR POLLUTION TRAINING INSTITUTE CURRICULUM DESCRIPTION AND RECOMMENDATIONS. VOLUME I. CURRENT TRAINING DESCRIPTION (FINAL REPORT). *Applied Science Associates, Inc., Valencia, Pa., Environmental Protection Agency Contract 68-02-0608, Rept. APTD-1552, 205p., April 20, 1973.*

NTIS: PB 231333/AS

A description of training courses currently offered by the Air Pollution Training Institute of the Control Programs Development Division of the Environmental Protection Agency is presented. The present volume describes the conduct of the Phase II effort of APTI and presents training descriptions on three levels: general-level description of APTI and its curriculum, summaries of the various subject fields within the curriculum, and individual courses descriptions. The subject fields are: legal aspects of air pollution control; types of sources, and effects of air pollution on man, animals, vegetation, and materials; handling air pollution data; air pollution control agency administration; testing of air pollution sources; air pollution control measures and control devices; meteorology, surveillance, and sampling; and analysis of air pollutants (laboratory procedures).

**41171** **APTIC NO. 63053**

National Commission on Materials Policy, Washington, D. C.

MATERIAL NEEDS AND THE ENVIRONMENT TODAY AND TOMORROW (FINAL REPORT). *289p., June 1973. 101 refs.*

GPO

A final report of the National Commission on Materials Policy is presented for the purpose of developing a national materials policy which recognizes the interrelationships among materials, energy, and the environment. Topics of the report include: the role of materials in American life; supply, use, recovery, and waste disposition in the materials system; the relationship between energy and materials; environmental factors in a materials policy; land and use; international aspects of materials policy; the interaction between science and technology and a materials policy; organization of government action; and inventories of materials. Various air pollutants are cited for their effects on human health, animals, and vegetation.

## 1972

**41172** **APTIC NO. 63331**

Matsui, Hideo

FUNDAMENTAL STUDIES ON THE AIR POLLUTION. PART VIII. HEAVY METALS IN SUSPENDED MATTER IN THE ATMOSPHERE OF NAGOYA. *(Taiki osen ni kansuru kisoteki kenkyu (dai8-ho), Nagoya shinai fuyu baijinchu no jukinzoku). Text in Japanese. Meijo Daigaku Rikogakubu Kenkyu Hokoku (Repts. Fac. Sci. Technol., Meijo Univ.), no. 13-275-280, 1972. 6 refs.*

The metallic constituents of atmospheric pollution have been receiving increasing attention in recent years because of their importance from a health standpoint. The air in an industrial area, a commercial area, and a perimeter residential area of Nagoya was monitored from Aug. 1970 to July 1971 for concentrations of metallic elements. After collection in wet impingers, the analysis was performed on the basis of chemical constituents. Heavy metals were determined by atomic absorption spectrophotometry. There was systematic and considerable pollution of the air with heavy metals near the metallurgical works in the industrial area. The concentrations of heavy metals depended on the nature of the principal industries. The distribution of lead in the air was correlated with the density of vehicular traffic. Correlation of vanadium concentration with that of sulfate indicated that heavy oil produced the metal during its combustion.

**41173** **APTIC NO. 63317**

Japan Environmental Agency, Tokyo

DATA ON THE BILL PROPOSING PARTIAL REVISION OF THE AIR POLLUTION CONTROL LAW. *(Taiki osen bonshiho no ichibu o kaisei suru horitsuan kankei shiryo). Text in Japanese. Japan National Diet, 72nd Session, 47p., March 1974.*

The present legislation on air pollution, specially on emission standards is based on the pollutant concentration of individual factory and on the height of emission sources. Naturally, this is not sufficient for controlling the level of the total emission quantity of a given area and various areas of Japan have not been able to attain the environmental standard designated by law. To eliminate such problems and to improve the air quality, this bill proposes partial revision of the present legislation to include articles authorizing local authorities (prefectural governors) power to determine the total emission quantity of a give area or a given industrial complex. This is to be based on a total regional plan and the amount of reduction required to meet the air quality standard. The emission standard for each individual factory and plant should be calculated for this plan. The governor should also determine the fuel standards to be adhered to by these factories and plants. The total text of the new bill is presented and is compared with the old legislation. Excerpts from the basic Environmental Protection Law (Law Code No. 132 of 1967) and the Air Pollution Control Law (Law Code No. 97 of 1968) are also presented.

## 1971

**41174** **APTIC NO. 64521**

Croke, E. J. and J. J. Roberts

AIR RESOURCE MANAGEMENT AND REGIONAL PLANNING. *Bull. At. Sci., 1971:8-12, Feb. 1971.*

Smoke abatement traditionally has relied on a corps of chimney watchers and equipment inspectors attempting to maintain surveillance under a general smoke ordinance. While this kind of surveillance is necessary, it usually indicates a control strategy which is vague and often unevenly applied. An alternative is air pollution control based on well-defined emission rights for each parcel of land in a region. In this approach, air resource management is integrated with urban and regional planning. Various factors involved in such an approach are discussed, including land use, the concept of zoning for pollution control, emission limits, dispersion models, models to define concentrations in the region, and inspections. (Author abstract modified)

**41175** **APTIC NO. 64546**

Perdon, H.

INFORMATION, DOCUMENTATION AND EDUCATION FOR AIR POLLUTION PREVENTION. *(Information, documentation, formation pour la prevention de la pollution atmospherique). Text in French. Apave, 51(175):63-66, 1971.*

The activities of the Documentation Center of the French Institute of Fuels and Energy in the area of information, documentation, and education in matters of air pollution prevention are presented. Papers dealing with air pollution prevention are summarized in a monthly bulletin for thermal documentation. Current information is distributed on new techniques and regulations. Standardization of air pollution-related terminology is attempted. Regular training courses are held for technicians and engineers in the area of thermal technology.

### 1970

**41176** **APTIC NO. 62965**

Moser, C. E.

AUTOMOTIVE EMISSION RESEARCH--REVIEW OF THE COORDINATING RESEARCH COUNCIL PROGRAM. *American Society for Testing and Materials, Philadelphia, Pa., Am. Soc. Testing Mater. Workshop Eff. Automot. Emiss. Requir. Gasoline Charact., Toronto, Ontario, 1970, ASTM Special Tech. Pub. 487, p. 13-19. 3 refs. (June 21-26.)*

The Coordinating Research Council s automotive emission research program is completing its third year of work. Some 30 projects are being undertaken under contract with research institutes, universities, government, and industrial laboratories. Results obtained will provide industry and government with technical information to aid in reducing automotive emissions. The purposes and organization of the research program and studies underway are reviewed. Medical studies are directed to determine effects of motor vehicle emissions on health, human performance, and behavior; initial studies concern the effects of carbon monoxide on humans, the toxicity of airborne contaminants, and the toxicity of polynuclear aromatics. Engineering projects include the effects of gasoline additives, the use of leaded fuels, fuel volatility, driving patterns, time-temperature studies, exhaust odor, combustion processes within engine exhaust systems, automotive fueling emissions, exhaust gas oxygenate content, exhaust gas particulate matter and polynuclear aromatic content, and inspection, maintenance, surveillance, and economic effectiveness.

## SOCIAL ASPECTS

### 1973

**41177** **APTIC NO. 63336**

Iwakuni Municipal Government (Japan), Dept. of Citizens Life

A REPORT ON A POLLUTION CONSCIOUSNESS INVESTIGATION. *(Kogai ishiki chosa hokokusho). Text in Japanese. 28p., Nov. 1973.*

The parents of 1023 kindergarten, nursery school, and eighth graders selected at random in Iwakuni were given a questionnaire to investigate their awareness of various pollution. The investigation was conducted between May 10-20, 1973, and 69.7% or 1023 parents responded. Of the total 98.4% who answered that they had heard the word pollution, 31.9% were presently very much annoyed by some form of pollution: 15.2% by dusts and smoke, 20.8% by bad odor, 9% by water pollution, 10.7% by river pollution, 14.3% by airplane noise, 13% by other vehicle noises, and 5.4% by automotive exhaust gases. As to actions against these complaints, 11.3% talked with the parties responsible for pollution either singly or with a group of people, 12% consulted with the local government authorities, and 44.1% did nothing. As to the degree of pollution, 41% felt that pollution in Iwakuni was serious, and 45.1% felt that something ought to be done; 37.8% felt it was unforgivable, but 51.5% were somewhat tolerant. As to the cause of pollution, 38.4% felt industries lacked the sense of responsibility, and 41.3% felt the government administration was lax in countermeasures. As to the future, 63.1% felt that the conditions will be worse in the future, and 21.5% felt the present condition will continue if not worsen.

## GENERAL

### 1974

**41178** **APTIC NO. 64937**

Hishida, K.

THE OUTLINE ON ENVIRONMENTAL POLLUTION. *(Kogai gairon). Text in Japanese. PPM (Japan), 5(5):2-22, May 1974.*

Wide area pollution generally refers to environmental pollutions such as smog and other air pollutants caused emissions from mobile sources. Pollutants such as stack gases emitted from specific factories are called local pollution. Primary pollutants can react together to form pollutants, also affect humans and plants. There are four techniques to reduce air pollution. Low-sulfur fuels can reduce the amount of sulfur oxides emitted by combustion. Generation of noxious materials can be controlled by efficient combustion of fuel. Dust collectors and other control equipment reduce noxious materials. The pollution concentration above the ground can be controlled through a diffusion by high chimneys. The diseases caused by environmental pollution include respiratory diseases such as chronic bronchitis, bronchial asthma, asthmatic bronchitis, and emphysema. Poisonous gases affecting plants are sulfur dioxide, sulfur trioxide, hydrogen fluoride, chlorine, hydrogen chloride, ammonia, hydrogen sulfide, and nitrogen dioxide, among which SO2 causes most plant damage.

**41179** **APTIC NO. 63233**

Horn, K.

ENVIRONMENTAL HYGIENE IN THE SOCIALIST SOCIETY. *(Umwelthygiene in der sozialistischen Gesellschaft). Text in German. Z. Ges. Hyg., Ihre Grenzgebiete (Berlin), 20(5):280-290, 1974. 13 refs.*

The leading role of socialist countries in the combat against environmental pollution is stressed. They were the first to point out the problems of environmental pollution in the United Nations. Due to their initiative the first international conference on the subject was called in 1971 by the UN Economic Commission of Europe. The difficulties of setting up immission and emission standards are reviewed. The synergistic effect of pollutants requires intensive investigation. Despite of the difficulties, maximum allowable immission concentrations were worked out in the German Democratic Republic for more than 100 individual pollutants and more than 20 pollutant combinations. A table lists those pollutants which require urgent further investigation such as oxides of nitrogen, hydrogen sulfide, mercaptans, hydrochloric acid, ammonia, and organic dusts.

**41180** **APTIC NO. 63334**

Kawamoto, Bin

ENVIRONMENTAL WHITE PAPERS. *(Kankyo hakusho ni tsuite). Text in Japanese. Sangyo to Kankyo (Ind. Environ.), 3(7):23-31, July 1974.*

The so-called environmental white papers, the annual report on pollution status of 1973, and the environmental control measures for 1974 are discussed. The main topics are the problem of cumulative pollution such as mercury and polychlorinated biphenyls and the problem of refuse treatment in the congested large urban areas. In addition to health standards, the amenity of environment became an important criterion. The overall decreasing trend in sulfur oxides, carbon monoxide, and suspended particulates, and the increasing trend in nitrogen oxides and stable hydrocarbon pollution are reported. Photochemical smogs are spreading not only in major cities but also in the smaller cities. The status of cumulative pollution and administrative measures taken in 1973, the nationwide survey, and enforcement of emission control are discussed. The movement for the preservation of natural environment, the oil shortage, the increase in refuse, industrial development, pollution control and local administration, environmental administration, and environmental protection and scientific technology are also discussed.

**41181** **APTIC NO. 63300**

Oppeneau, J. -C.

RESEARCH PROGRAMS IN THE AIR POLLUTION AREA. *(Programmes de recherches dans le domaine de la pollution atmospherique). Text in French. Pollut. Atmos. (Paris), 16(61):45-53, Jan.-March 1974.*

Concerted research programs conducted in France in the air pollution area under the guidance of the Ministry of Environmental Protection are overviewed. In one research program concerning the effects of air pollution on vegetation, the chronic and acute effects of sulfur dioxide, nitrogen oxides, and oxidants, as well as their combinations, on plants (including trees), and the screening effect of woods are studied. Another research program is concerned with the reactions involved in the formation of nitrogen oxides in combustion equipment, and with methods and possibilities for the abatement of nitrogen oxides emissions. Other projects are concerned with the study of the formation of unburned solids and possibilities of their abatement in combustion equipment and incinerators, and with automotive exhaust emissions. The relationships between respiratory pathology and environmental factors, including air pollution, are studied in epidemiological surveys. Other programs are concerned with the long-distance transport of sulfurous emissions, the effects of pollutants on materials, with aeraulic, aulic, and numerical simulation of pollutant dispersion in industrial sites, with the analysis and measurement of air pollutants and their physicochemical behavior and interactions.

**41182** **APTIC NO. 63346**

Vilser, Otto

THE FOEHN HELPED TO SPEED UP ENVIRONMENTAL PROTECTION. *(Der Foehn hat Umweltschutz vorangebrachet). Text in German. Umwelt (Duesseldorf), 4(3):37-41, 1974.*

The foehn, a warm wind typical of the Munich area, prevents on 78% of all days a rapid dispersion of the exhaust gas saturated air of Munich s streets. When in 1970 a carbon monoxide emission of 2350 tons was determined, the city decided to do something to quickly improve the situation. Annually $66,000 were appropriated for enlarging the city s green areas. The city center was closed for traffic and converted into a shopping mall. A tree protection order was issued which demands that for every tree cut down two new ones have to be planted. In 1974, 44,000 car owners could participate in a free exhaust gas emission test. These tests revealed that only 36% of the examined vehicles had the carburetor adjusted correctly, for 52% the carburetor had to be adjusted on the spot and 11% had to be sent to a repair shop. Since January 1971 the city is testing liquid gas operated engines of which two are installed in solid waste collection trucks, one in a street sweeping vehicle and one in a passenger car. The city accommodates only clean industries and therefore has a low sulfur dioxide emission. A severe set-back in the city s efforts to clean up with its environmental pollution comes from the solid waste disposal section. It has been entirely overlooked that the capacity of the existing incinerators is reaching its limit in 1975 and that the dump is nearly filled to capacity too. The ugly 45 m high waste dump is a source for toxic gases which according to experts will continue to come out from the dump for years after the dump has been closed for further disposal.

**41183** **APTIC NO. 63050**

North Atlantic Treaty Organization, Committee on the Challenges of Modern Society

AIR POLLUTION. AIR QUALITY CRITERIA FOR PHOTOCHEMICAL OXIDANTS AND RELATED HYDROCARBONS (FINAL REPORT). *Rept. N. 29, 450p., Feb. 1974. 657 refs.*

A compendium of information, using the Unite/d States Air Quality Criteria for Photochemical Oxidants and Air Quality Criteria for Hydrocarbons as basic documents, is presented on the effects of photochemical oxidants and related hydrocarbons in the ambient air on man and his environment. The occurrence, properties, and fate of atmospheric photochemical oxidants and the principles of formation and control are reviewed in the earlier chapters, followed by a discussion of measurement methods and chemical interactions for specific hydrocarbons, gaseous aldehydes and ketones, total oxidants, ozone, and peroxyacetyl nitrate. Effects are considered in relation to materials, vegetation, animals, and man. Reviews of both toxicological and epidemiological studies are presented.

**41184** **APTIC NO. 63299**

ENVIRONMENTAL PROTECTION. *(Umweltschutz). Text in German. Tech. Ueberwach. (Duesseldorf), 15(5):182-186, May 1974.*

General problems and objectives in environmental protection in West Germany, and the environmental protection-related activity of Technische Ueberwachung (Technical Inspection) are surveyed. Some 300 scientists of the Technical Inspection are dealing with problems of air pollution, noise abatement, waste water treatment, and waste disposal; the calibration of dust and sulfur dioxide concentration measuring instruments are also considered. Prophylactic environmental protection requires the use of automatic air quality monitoring networks. The particulate emission from heavy fuel oil firing equipment has been limited to 70 mg/N cu m, or to an average of 1.5 g/kg fuel oil. Nitric oxide, nitrogen dioxide, carbon monoxide, hydrocarbon, lead, and particulate concentration measurements conducted in urban agglomerations during the Sunday traffic ban revealed gas particulate concentrations to be 50-90% and 10-50% lower than on days with unrestricted traffic.

**41185** **APTIC NO. 64434**

Tokyo Metropolitan Government (Japan), Bunkyo District

PUBLIC NUISANCES IN THE BUNKYO DISTRICT, 1973. *(Bunkyo-ku no kogai, Showa 48-nendo). Text in Japanese. 164p., March 1974.*

A survey of the Bunkyo district air pollution, control measures by the district office, public awareness of pollution conditions, complaints and appeals, and the state of traffic, noise, water pollution and future problems are discussed. About 70% of the district is traditionally residential and 50% of this is occupied by 16 universities and colleges and 170 schools of various types. The rest is commercial and sub-industrial. Therefore, pollution in this district is believed to be relatively small compared to other districts, but the problem is gradually expanding. The number of complaints registered in the first half of 1973 was 110, mostly against bad odor and noise. The plants in this area are predominantly engaged in printing and bookbinding. The measurements of sulfur dioxide over the last 3 yr indicate a rise in concentration between December and March every year due to the heating facilities. Photochemical smog warnings have increased in number every year, and 45 warnings were issued in 1973. The level of oxidant is generally high in July and August and it was higher in 1973 than in previous years. The levels of nitric oxide and nitrogen dioxide have increased drastically in 1973, especially in August. Ninety percent of all measurements between January and October failed to pass the NOx environmental standard, while 15.2% of SO2 measurements exceeded the standard. None of the carbon monoxide measurements exceeded the standard.

## 1973

**41186** **APTIC NO. 62922**

Malenbaum, Wilfred, Carol Cichowshi, Fathollah Mirzabagheri, and James Riordan

MATERIALS REQUIREMENTS IN THE UNITED STATES AND ABROAD IN THE YEAR 2000. *Pennsylvania Univ., Wharton School, 44p., March 1973. 11 refs.*

NTIS: PB 219675

World materials requirements from 1951 to 2000 are described for ten divisions of the world based on economic growth patterns: Western Europe; Japan; other developed lands including Australia, Canada, Israel, New Zealand, and South Africa; the Union of Soviet Socialist Republics; Eastern European Countries; Africa minus South Africa; Asia, minus Israel, Japan, Mainland China, and related areas; Latin America; China, plus Mongolia, North Korea, and North Vietnam; and the U. S. The gross domestic product (GDP) in 1971 U. S. dollars is projected to the year 2000 for each of the 10 divisions. On the basis of these GDP projections and other considerations, the requirements of crude steel, iron ore, refined copper, primary aluminum, zinc, fluorspar, sulfur, total energy, and energy fuels for each of the 10 divisions are projected for the year 2000. (Author abstract modified)

**41187** **APTIC NO. 63339**

Sendai Municipal Government (Japan), Bureau of Public Health

WHITE PAPER ON PUBLIC NUISANCE, 1973. *(Kogai Hakusho, Showa 48-nendo). Text in Japanese. 173p., Nov. 1973.*

In this 1973 report on the state of public nuisance in Sendai, the following topics are discussed in the category of air pollution: wind direction frequency, wind speed frequency, inversion, settling particles, suspended particulates, sulfur oxides, hydrogen sulfide, carbon monoxide, nitrogen oxide, oxidants, effects of air pollutants on plants, regulations concerning domestic heating fuels (sulfur content), emission quantity regulations, and special facility registration procedures. Water pollution, noise, vibration, land settling, and bad odor are also discussed. In the chapter for pollution control and prevention measures, the establishment of air monitoring systems, emission quantity control measures (fuel regulations and total emission control), city ordinances, oxidants countermeasures, and various investigative and research programs are briefly discussed. The 1972 monthly average of settling particles was 4.67 tons/sq km/mo as compared with the 1971 s 5.05 tons/sq km/mo. The highest measurement for suspended particulates in 1972, measured by high vol sampler was 0.263 mg/cu m, which was 0.208 mg/cu m lower than that of the previous year. The minimum was 0.74 mg/cu m, and was similar to that of 1971. Sulfur oxides are measured at 22 locations in the city by the lead dioxide method. The total average for 1972 was 0.15 mg/100 sq cm/day, as compared to 0.19 mg/100 sq cm/day in 1971. The sources of nitrogen oxides in Sendai are mostly automobiles rather than factories, and the total average is 0.020 ppm.

**41188** **APTIC NO. 64433**

Chiba Prefectural Government (Japan), Dept. of Environment

CHIBA PREFECTURE WHITE PAPER ON PUBLIC NUISANCES, 1973. *(Chiba-ken kogai hakusho). Text in Japanese. 589p., Nov. 1973.*

This 1973 compendium of data on environmental pollution in Chiba prefecture includes the total picture of problems in this rapidly growing industrial area including several major petroleum, petrochemical, and steel industries. The meteorological conditions, air pollution monitoring system, the state of air pollution, water pollution, land settling, noise, vibration and odor, soil pollution and pesticides, and solid waste from industries are surveyed. The pollution control administration, control systems, management organizations, budgeting, personnel training system, complaints, public information, control plans in general and for specific areas, pollution control agreements between government agencies and major industries, health damage compensation methods, control system installation subsidy system, and a general program for preservation of natural environment are discussed. As specific investigation and research programs, the Prefectural Environmental Pollution Research Inst. is conducting researches on photochemical smog and the weather, suspended particulates components, effects of pollutants on agricultural produce, environmental quality and dying pine trees, and effects of the SOx levels on flue gas dusts.

**41189** **APTIC NO. 64492**

Tokyo Metropolitan Government (Japan), Chuo Dist.

THE PRESENT STATE OF PUBLIC NUISANCES IN THE CHUO-DISTRICT AND COUNTERMEASURES. *(Chuo-ku no kogai no gaikyo-genjo to taisaku). Text in Japanese. 181p., Sept. 1973.*

A general discussion of pollution conditions caused by plants and business operations in the Chuo-ku, complaints by citizens, the state of air pollution, monitoring system, automotive exhaust gases, photochemical smog, land use, health examination, school damages, opinion surveys, pollution control subsidies, and environmental standards and regulations is presented. The Chuo district of Tokyo comprises 77.9% of commercial area, 1.9% of industrial area, and the rest of sub-industrial and residential areas. The greater part (83.7%) of its 1329 plants are intermingled with commercial outfits, 70% of them being printing and bookbinding plants. In 1972, of the total 200 complaints against pollution, 82 were for air pollution: 17 cases for soot, 7 for dusts, 6 for harmful gases, and 52 for bad odor. Sulfur oxides, suspended particulates, nitrogen oxides, carbon monoxide, wind direction, wind velocity, and oxidant are continuously monitored. The 1972 average of SOx was 1.9 pphm, representing a 30% reduction over 1971. Further control will be necessary to meet the new 1973 environmental standard. The 1972 average of suspended particulates was 6.9 mg/100 cu m, a 1.3% increase over 1971. The levels of both nitric oxide and nitrogen dioxide in this area are the highest in Tokyo, with a tendency for further increase. For other pollutants, the Chuo district averages are not among the highest. The number of victims suspected of reactions to photochemical smogs was 83 in 1970, 225 in 1971, and 27 in 1972 and the damages were minor.

## 1971

**41190** **APTIC NO. 64545**

Detrie, J.-P.

STUDIES AND RESEARCH ON 'THE MEASUREMENT OF NUISANCES, THEIR EFFECTS AND THEIR PREVENTION. PROBLEMS OF SPACE PLANNING.

*(Les etudes et recherches sur la mesure des nuisances leurs effets et la prevention. Problemes d amenagement territoire). Text in French. Apave, 52(175):57-62, 1971.*

Studies on the generation, effects, measurement, dispersion, and prevention of air pollutants in France are surveyed. The effects of particulate, unburned matter, and asbestos on lung tissues; effects of carbon monoxide, sulfur dioxide, and exhaust gases on animals; and the effects of SO2 and fluorine compounds on plants are being studied. Shell-Bacharach opacimeters and automatic recording instruments adopting the beta-ray attenuation principle for dust captured on filter are available for the measurement of smoke emissions. The ground level concentrations of combustion process-generated air pollutants are measured by means of S.F. (Smoke-Sulfur) measuring instruments. The dispersion of air pollutants is studied by hydraulic models. Fuel and flue gas desulfurization processes are being studied, partly on a semi-industrial scale. The implementation of emission standards and the introduction of improved firing techniques have resulted in a considerable abatement of the SO2 and smoke concentrations both in Paris and London for the last 10 years.

**41191** **APTIC NO. 64547**

Rul, Rene

THE GREAT FEAR OF THE YEAR 2000. THE ILLS OF THE ENVIRONMENT. *(La grande peur de l an 2000. Les maladies de l environnement). Text in French. Apave, 52(175):81-84, 1971.*

General ecological problems of human activity and anthropogenic environmental pollution are discussed. Air pollution due to industrial processes, domestic heating, and automobile traffic; water pollution due to industrial activity; and environmental contamination with pesticides are the major environmental problems which must be solved if mankind is to survive. Human creativity, which brought about environmental pollution, has, however, also developed means of controlling such pollution. Strict regulations imposed on pollution sources also greatly contribute to pollution abatement. In Paris, air pollution has decreased by over 50% since 1960, and the quality of the air in London, once almost unfit to breathe, has improved appreciably.

**41192** **APTIC NO. 64557**

United Nations, Dept. of Economic and Social Affairs

EVALUATION OF NEW TECHNOLOGIES FOR THE DETECTION, MONITORING, ANALYSIS OF ATMOSPHERIC POLLUTANTS RELEASED BY ENERGY ENTERPRISES. *Preprint, 48p., June 1971. 20 refs. (Presented at the United Nations Conference on Human Environment, 1971.) (Available from Univ. Microfilms, Inc., Ann Arbor, Mich., Order no. WO 62039 2.19.)*

The world consumption of energy increased at a rate of 5% between 1950-1968. Nearly 80% of all air pollution is caused by energy producing industries and processes. Sources, measurement methods, and control methods for air pollution are reviewed. Flue gas desulfurization techniques include fluidized bed combustion, alkalized alumina process, catalytic oxidation, and dolomite injection. Sulfur dioxide is commonly monitored using West-Gaeke or hydrogen peroxide methods. The mass spectrometer and gas chromatograph are usually used to monitor carbon monoxide in the laboratory. A sensitive and reliable CO monitoring device is an infrared analyzer. Infrared technology has a great potential in monitoring, detection, and analysis of air and water pollution. Applications of lidar or optical radar can be used in atmospheric monitoring. Satellite systems can monitor global pollution and can locate air pollution sources. Magnetohydrodynamics and electro gas dynamics can give 60% operating efficiency for electricity production compared to 40% for steam turbine plants. A cost effective analysis of energy sources is given. Oil desulfurization ranges from $0.20 to $0.80 a barrel. Reduction of sulfur below 0.5% in oils and 1.5% in coal increases desulfurization costs. Technology is available to control thermal pollution at a cost of 5% of total investment costs. Pollution control requirements will represent about a 17.6% increase above the cost for electric power. Air resource management is described. Air pollution implications should be considered in all future energy producing activities. Local and national programs on pollution detection, monitoring, analysis, and abatement should be merged into an integrated global program. International cooperation and exchange of information should be part of the global environmental control program. (Author abstract modified)

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